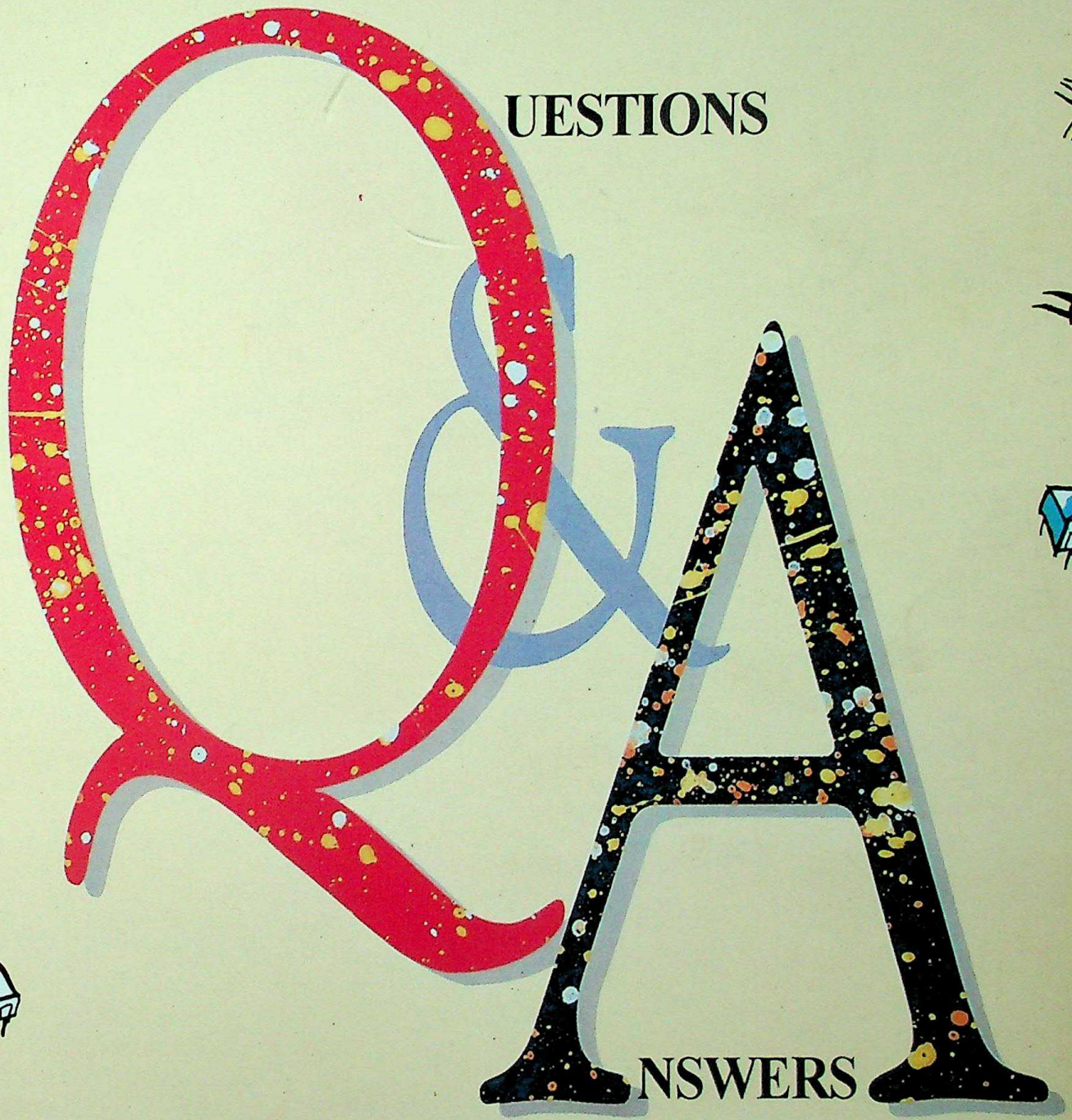
Gandhi Memorial College Of Education Bantalab Jammu

DIPLOMA IN COMPUTER STUDIES



INFORMATICS

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INFORMATICS

DIPLOMA IN COMPUTER STUDIES

Validated by

University of Cambridge Local Examinations Syndicate

17 DECEMBER 1995

CS101 • *COMPUTER SYSTEMS*

DURATION : 2 HOURS

INSTRUCTIONS

1. Write your **CANDIDATE NUMBER** and the **MODULE NUMBER AND NAME** clearly on your answer booklet(s).
2. Answer **ALL** questions in Section A and any **THREE** from Section B.
3. Start each question in Section B on a new sheet of paper.
4. The number of marks for each part of a question is indicated in square brackets in the right hand margin.

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SECTION A

[40 marks]

Answer ALL questions in this section.

A1. Write in your answer booklet the words to fill the spaces in **each** of the statements below.

(a) Computers take incoming data called _____ , process it and produce outgoing data called _____ .

[2]

(b) Kb is an abbreviation used to represent approximately _____ bytes of storage while Mb is used to represent _____ bytes of storage.

[2]

(c) The _____ of the CPU monitors the operation performed by the computer system. The other **two** components of the CPU are the ALU and _____.

[2]

(d) The _____ printer operates mechanically with the hammer striking a key in a manner similar to a typewriter. The thermal printer, on the other hand, uses _____ technology to produce images.

[2]

(e) COM stands for _____ and DASD stands for _____.

[2]

(f) An input or output device connected to and capable of communicating with the computer system is said to be _____ . If it is situated far away from the computer system then it is said to be _____ .

[2]

(g) The _____ is the number of times per second that a system, especially a data transmission channel, changes state. In the case of a binary channel, it is equal to the _____ rate.

[2]

(h) In the various data processing options, _____ processing refers to processing at separate locations which are linked by communication lines. _____ processing has only one location for processing all jobs from remote sites.

[2]

(i) _____ refers to the technique of updating files with transactions of data immediately, therefore the system must be _____.

[2]

(j) The three switching techniques are _____, _____ and packet switching.

[2]

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A2. Explain the following terms:

(a) Turnkey services

(b) Computer virus

(c) PROM

(d) Seek time

(e) Latency period

[10]

A3. Differentiate the following :

(a) Data : Information

(b) Bit : Byte

(c) RAM : ROM

(d) Polling : Addressing

(e) Bar Code Reader : MICR

[10]

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SECTION B

[60 marks]

Answer any THREE questions in this section.

B1.

(a) List **four** benefits of using computers. Provide brief explanations.

[8]

(b) An organisation can choose to implement its computer system using a mainframe or a network of microcomputers.

(i) List **two** differences between a mainframe and a microcomputer.

[2]

(ii) Explain **two** advantages a network of microcomputers may have over a mainframe.

[4]

(c) Some of the numbers in the ASCII code system do not produce printable characters; instead they are used for control codes. Give **one** example of a control code which might be used on a computer screen and **one** which could be used on a printer (you do not need to give the actual code numbers; just say what the codes do).

[2]

(d) Briefly explain why computers have to convert all data to binary digits before processing.

[2]

(e) What happens during the fetch - execute cycle ?

[2]

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B2. The backup and correct storage of data is essential for the recovery and maintenance of an information system.

(a) Describe the Grandfather/Father/Son backup process.

[5]

(b) Should backup copies be stored in the same location as the original ? Justify your answer.

[2]

(c) With the aid of diagrams, show how data is stored on a magnetic disk pack.

The diagrams should include :

cylinder

track

sector

read-write head

non-recordable surfaces

spindle

[6]

(d)

(i) The parity bit system is a common error checking method. What is it?

[2]

(ii) What is an odd parity system ? Show an example with the byte 1011001. Include the necessary bit.

[2]

(iii) What is the limitation of the parity bit system ? Demonstrate with an example. In spite of this limitation, parity is still often used. Why ?

[3]

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B3. A supermarket has a few branches situated separately from each other. They are contemplating setting up a fully computerized system where each product sold could be identified by a product bar code.

(a) Suggest **three** pieces of computer equipment other than a bar code reader which would be suitable for use at the point of sale, indicating the purpose of each.

[6]

(b) Installing such a system has benefits for both customers and management. Suggest **three** benefits to the customers and **three** benefits to the management.

[6]

(c) Describe what happens in terms of data processing after the bar code has been read at the point of sale terminal.

[4]

(d) Part of the design involves linking the point of sale terminals to two identical computers. Why are two computers used ?

[1]

(e) At the end of each day the computer can generate new orders to replace goods which have been sold. What **two** fields must be present in the stock file to allow this to happen ?

[2]

(f) The orders which are automatically generated will normally be checked by a person before being submitted. Suggest **one** reason why the manager might want to alter the automatically generated order.

[1]

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B4. Networking has become one of the largest growth areas in IT over the recent years.

(a) One network topology is called a mesh. Illustrate with diagrams the other **three** different network topologies. Describe **two** features of each. [9]

(b) The mesh network is often used in applications requiring high reliability. Describe the feature of the mesh network which makes it suitable for this purpose and explain why it is present. What is the disadvantage of designing networks in this way ? [3]

(c) Describe **four** tasks which the CCU might undertake in the network system. [4]

(d) What is a concentrator and what does it do ? [2]

(e) What is a multiplexor and what does it do ? [2]

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SECTION A

[40 marks]

Answer ALL questions in this section.

A1. Write in your answer booklet the words to fill the spaces in **each** of the statements below. **[20]**

(a) Computers take incoming data called (a) **input**, process it and produce outgoing data called **(b) information**. [2]

(b) Kb is an abbreviation used to represent approximately **(a) 1000 or 1024** bytes of storage while Mb is used to represent **(b) 1 million** bytes of storage. [2]

(c) The **(a) CU** of the CPU monitors the operation performed by the computer system. The other 2 components of the CPU are the ALU and **(b) MM/RAM**. [2]

(d) The **(a) impact** printer operates mechanically with the hammer striking a key in a manner similar to a typewriter. The thermal printer, on the other hand, uses (b) heat technology to produce images. [2]

(e) COM stands for **(a) Computer output on microfilm** and DASD stands for **(b) Direct Access Storage Device**. [2]

(f) An input or output device connected to and capable of communicating with the computer system is said to be **(a) On-line**. If it is situated far away from the computer system then it is said to be **(b) remote**. [2]

(g) The **(a) baud rate** is the number of times per second that a system, especially a data transmission channel, changes state. In the case of a binary channel, it is equal to the (b) bit rate. [2]

(h) In the various data processing options, **(a) distributed** processing refers to processing at separate locations which are linked by communication lines. **(b) Centralised** processing has only one location for processing all jobs from remote sites. [2]

(i) **(a) Real-time** refers to the technique of updating files with transactions of data immediately, therefore the system must be **(b) On-line**. [2]

(j) The three switching techniques are **(a) circuit, (b) message** and packet switching. [2]

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A2. Explain the following terms: [10]

(a) Turnkey services

Turnkey services : the supply and installation of a computer system in such a complete form that the user need only "turn a key" as it were to commence using the system. [2]

(b) Computer virus

Computer virus : programs that infect other programs by modifying them to include a copy of itself. On activation, it causes corruption to other programs or computer files. [2]

(c) PROM

PROM : Programmable Read Only Memory. Semi-conductor memory which is non-volatile. Programs are 'burnt-in' and are unalterable. [2]

(d) Seek time

Seek Time : Time taken for the read/write head to position itself on the track where desired record is found. [2]

(e) Latency period

The time taken for the desired record to be positioned under the head, by rotation of the disk. [2]

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A3. Differentiate the following : **[10]**

(a) Data : Information

Data - raw facts that are gathered from any source but not organized, cannot be used to make decision [1]

Information - data which is well-organized and processed, increase the understanding of the data and can help in decision-making. [1]

(b) Bit : Byte

Bit - Binary digit which consists of '1' and '0'. [1]

Byte - Group of bits used to represent a character, usually 7 or 8 bits. [1]

(c) RAM : ROM

RAM : temporary/volatile storage created during program execution [1]

ROM : permanent/non-erasable storage containing permanent instructions [1]

(d) Polling : Addressing

Polling : 'Asking' terminals if there is data to transmit;

a request to send. [1]

Addressing : Send to specific terminal(s). [1]

(e) Bar Code Reader : MICR

Bar Code Reader : reads strips of black and white of different width (commonly used with a POS terminal in supermarkets) [1]

MICR : reads figures printed using magnetised ink (commonly used on bank cheques) [1]

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SECTION B

[60 marks]

Answer any THREE questions in this section.

B1.

(a) List **four** benefits of using computers. Provide brief explanations.

[8]

Any four :

consistency - always get the same result for the same input data

speed - can do calculations etc. very quickly

accuracy - do not make mistakes in calculations

large storage - compared with paper documents

cost - cheaper in the long term because less staff are needed

corporate image - company looks "good" if it is "high tech"

competition - may need to offer something better than competitor

any other reasonable benefit with explanation

(any four benefits - 1 mark each)

(explanations - 1 mark each) [max 8]

(b) An organisation can choose to implement its computer system using a mainframe or a network of microcomputers.

(i) List **two** differences between a mainframe and a microcomputer.

[2]

(any two - 1 mark each) :

mainframe much more expensive

mainframe has higher processing speed

mainframe has greater storage capacity

mainframe can support large variety of I/O devices [max 2]

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(ii) Explain **two** advantages a network of microcomputers may have over a mainframe.

[4]

(Any two - 2 marks each)

economical - total cost of PC network cheaper than mainframe

flexibility - each micro may run resident application programs

upgrade - each terminal can be upgraded separately

any reasonable explanation [max 4]

(c) Some of the numbers in the ASCII code system do not produce printable characters; instead they are used for control codes. Give **one** example of a control code which might be used on a computer screen and **one** which could be used on a printer (you do not need to give the actual code numbers; just say what the codes do).

[2]

screen : (any one - 1 mark each)

clear screen

sound the bell or beeper [max 1]

printer : (any one - 1 mark each)

move print head to specific tab position

change to a different font style

or any other suitable examples [max 1]

(d) Briefly explain why computers have to convert all data to binary digits before processing.

[2]

All information in the computer is stored in memory cells

which can have only 2 possible states - on or off. [2]

(e) What happens during the fetch - execute cycle ?

[2]

Instruction is fetched from main memory into the CPU [1]

it is decoded and then the instruction is carried out [1]

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B2. The backup and correct storage of data is essential for the recovery and maintenance of an information system.

(a) Describe the Grandfather/Father/Son backup process. [5]

update of tape is output to a new reel [1]

new reel becomes son [1]

old reel becomes father [1]

oldest becomes grandfather [1]

if son file is corrupted, father file used to regenerate son file. [1]

(b) Should back up copies be stored in the same location as the original ? Justify your answer. [2]

No [1]

So that if there is a fire and the original is destroyed or it is stolen then the backup copy will still be available. [1]

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(c) With the aid of diagrams, show how data is stored on a magnetic disk pack.

[6]

The diagram should include :

cylinder

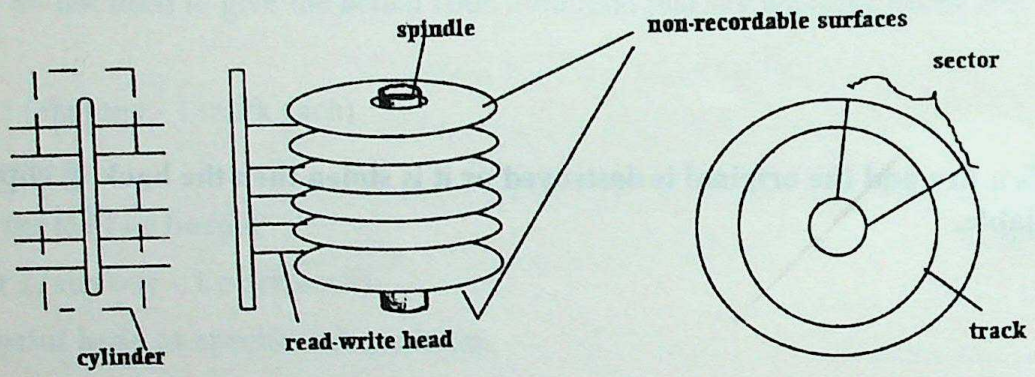
track

sector

read-write head

non-recordable surfaces

spindle



[1 mark per item, max 6]

(d)

(i) The parity bit system is a common error checking method. What is it?

[2]

Parity bit system is a system to aid verification of data transfer [1]

involves adding a bit to each byte to ensure standard number of 1 bits; either odd or even [1]

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(ii) What is an odd parity system ? Show example with the byte 1011001. Include the necessary bit.

[2]

Odd parity system is when the number of '1' bits in a byte inclusive of parity bit must be odd [1]

for example:

original : 1011001

parity bit : 1 (to make number of '1's odd)

after : 10110011 (5 '1's) [1]

(iii) What is the limitation of the parity bit system ? Demonstrate with an example. In spite of this limitation, parity is still often used. Why ?

[3]

Limitation :

transposition error.

two or more bits affected eg original : 10110011

affected : 01110011 but no error detected

(any one reason - 1 mark)

(example : 1 mark) [max 2]

Parity is still used because it is very simple and can detect some errors [1]

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B3. A supermarket has a few branches situated separately from each other. They are contemplating setting up a fully computerized system where each product sold could be identified by a product bar code.

(a) Suggest **three** pieces of computer equipment other than a bar code reader which would be suitable for use at the point of sale, indicating the purpose of each.

[6]

(Any three - 1 mark equipment each, 1 mark reason each) :

Terminal

- to display message

keypad/keyboard

- to input data

computer

- to process data

ECR

- to dispense cash

communication link

- to communicate with banks/head office

Credit card reader

- to capture customer's data on credit card

[max 6]

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(b) Installing such a system has benefits for both customers and management. Suggest **three** benefits to the customers and **three** benefits to the management.

[6]

Benefits of a POS/EFT system for customers:

Any three (1 mark each):

Faster checkouts

Do not need to have cash at hand

Detailed receipts

Less chance of errors

Many purchase on credit

[max 3]

Benefits of a POS/EFT system for management :

Any three (1 mark each) :

More effective utilisation of personnel

Better control over customer credit

Better cash control

Better inventory control

Better management

Convenient

Reduced paperwork

Reduced need for cash

Potential decrease in cost

[max 3]

(c) Describe what happens in terms of data processing after the bar code has been read at the point of sale terminal. [4]

transmitted to computer

number looked up in product data file

price and description transmitted back to POS terminal

stock records adjusted

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(d) Part of the design involves linking the point of sale terminals to two identical computers. Why are two computers used ?

[1]

So that if one fails the other is still available [1]

(e) At the end of each day the computer can generate new orders to replace goods which have been sold. What **two** fields must be present in the stock file to allow this to happen?

[2]

Any two (1 mark each) :

item code and item description

supplier code

quantity of item in stock

minimum quantity allowable / stock level at which re-order should take place

[max 2]

(f) The orders which are automatically generated will normally be checked by a person before being submitted. Suggest **one** reason why the manager might want to alter the automatically generated order.

[1]

Any one (1 mark each) :

the product will not be stocked any longer

the product is seasonal and the season is coming to an end

a special promotion is about to start or end for the product

any other suitable reason

[max 1]

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B4. Networking has become one of the largest growth areas in IT over the recent years.

(a) One network topology is called a mesh. Illustrate with diagrams the other **three** different network topologies. Describe **two** features of each.

[9]

Ring:

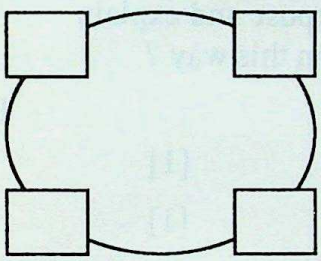
- one way data flow normally

- ring monitor

equal intelligence for all terminals

[max 2]

- diagram [1]



Star :

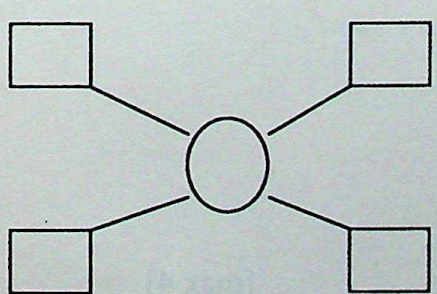
- Central node

- If central goes down, whole system out of action

- direct interconnection between any two is possible at any one time

[max 2]

- diagram [1]



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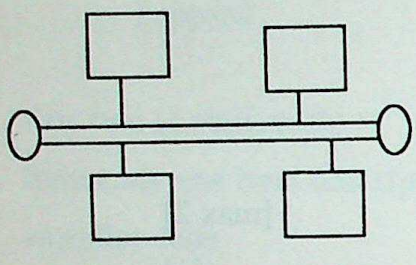
Bus/highway:

all terminals must be smart to 'listen' in for their address.

only one transmission at any one time. [max 2]

diagram [1]



[max 9]

(b) The mesh network is often used in applications requiring high reliability. Describe the feature of the mesh network which makes it suitable for this purpose and explain why it is present. What is the disadvantage of designing networks in this way ?

[3]

mesh network has multiple connections between each node [1]

if one node is destroyed data can still be transferred via other nodes [1]

Disadvantage is that the system is expensive because there are so many repeated connections. [1]

(c) Describe **four** tasks which the CCU might undertake in the network system.

[4]

Functions of a CCU:

Any four :

- connecting hundreds of communication lines to central computer

- adapting host to data network

- storing and holding data

- providing data protection and accountability

- detecting errors

- adding/deleting of communication control code

- determining distribution of information

- controlling message priority

(any four - 1 mark each) [max 4]

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(d) What is a concentrator and what does it do ? [2]

A concentrator is a minicomputer which can reduce line costs by accepting information from many terminals [1]

over slow speed lines and transmitting it to the host computer over high speed line. [1]

(e) What is a multiplexor and what does it do ? [2]

A Multiplexor is an electronic device which divides a high speed channel [1]

into multiple channels of a slower speed. [1]

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5.

(a) What is meant by data collection?

[2]

Data collection is the process involved in getting the data from its point of origin to the computer [1]

in a form suitable for processing [1]

(b) Some examination boards receive lists of candidates and the exams they are to take from schools and colleges as typed lists. These lists contain 5 fields: surname, first name, sex, date of birth and the code numbers for the exams to be taken. For example:

SMITH JOHN M 22/08/77 7403,7453,6476

is the entry for John Smith. Once the data has been received by the exam board it is keyed into a computer and stored on disc as the Entries Master File.

(i) Name **four** types of possible error that could occur in the data collection stages.

[4]

Possible Errors (any four, 1 mark each) :

missing documents

entries omitted in source documents

transcription errors

data preparation errors

transposition errors

any other

[max 4]

(ii) Why is it important to control the quality of input data ?

[2]

Garbage in garbage out. [1]

Accuracy of processed information depends on accurate input. [1]

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(iii) The data which is keyed in will be both **validated** and **verified**. Explain briefly the meaning of these two terms.

[2]

validated means checking that the data is reasonable or possible; computer process [1]

verified means checking that the data has been entered without error; manual process [1]

(iv) For the sample data shown above pick **two** fields and explain briefly how they could be validated.

[2]

Any two (1 mark each) :

The sex field should only contain M or F

The exam codes could have check digits

Any other suitable example can be accepted

[max 2]

(v) How could data be verified by double punching ?

[3]

It is keyed in a second time [1]

the second copy is compared to the original [1]

any differences are flagged as errors [1]

(vi) Even after the data has been validated and verified there could still be errors. Explain how errors could still be present and give **one** example of an error which could be present in the exam entry data.

[2]

errors in original data will be carried through [1]

any suitable example with error in name, date or code [1]

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(c) The exam board feels that it would be more efficient to get the schools to type the data directly into a computer and send a disc to the board containing the data. Suggest **two** reasons why this might be a good idea and **one** reason why it might cause problems.

[3]

Any two (1 mark each) :

it saves money for the board - they do not have to have so many typists

it speeds up the entry process - no re-keying at the exam board

any other suitable example

[max 2]

Any one (1 mark each) :

the school may not verify the data properly

different schools may have different computer systems from the board making exchange of data difficult

any other suitable example

[max 1]

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INFORMATICS

DIPLOMA IN COMPUTER STUDIES

Validated by

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17 DECEMBER 1995

SW102 • *SOFTWARE AND INFORMATION PROCESSING*

DURATION : 2 HOURS

INSTRUCTIONS

1. Write your **CANDIDATE NUMBER** and the **MODULE NUMBER AND NAME** clearly on your answer booklet(s).
2. Answer **ALL** questions in Section A and any **THREE** from Section B.
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SECTION A

[40 marks]

Answer ALL questions in this section.

A1. Explain the difference between the following:-

(a) workfile and masterfile [2]

(b) CAD and CAL [2]

(c) machine code and COBOL [2]

(d) inserting and appending records [2]

(e) security and privacy of information [2]

A2. List the **four** purposes of documentation. [4]

A3. Name the **three** objectives of a database system. [3]

A4. Distinguish between the following:-

(a) multiprogramming and multiprocessing [4]

(b) schema and subschema [4]

(c) spooling and interrupt [4]

A5. What are the primary duties and responsibilities of a database administrator? [4]

A6. What are the **three** main skills required by a systems analyst ? [3]

A7. Briefly explain why the following are important in the design of a computer system :

(a) input [2]

(b) file organisation [2]

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SECTION B

[60 marks]

Answer any THREE questions in this section.

B1.(a) Define the term 'application package'.

[2]

(b) Wordprocessing, spreadsheet and database packages are commonly referred to as general purpose packages. Identify **two** areas in business where specialist application packages are used and describe the type of package used.

[4]

(c) Explain **two** advantages and **two** disadvantages of using an application package.

[4]

(d) A hospital is setting up a new unit to care for babies who have special needs at birth; for example, those who are born too soon. The consultant decides that a computer system will be used to store information about the babies and that a specially written package will be needed.

(i) Apart from normal data entry methods, name **two** special devices that might be used in the hospital to collect data about the **babies** and state what information they would collect.

[2]

(ii) When each baby is admitted to the care unit some information needs to be recorded. One piece of information will be the reason the baby has been admitted such as premature birth or very low birth weight. The computer asks the nurses to enter a short numeric code instead of these descriptions. Suggest **one** reason why the number code is better, **one** problem with using the number code and **one** way in which the problem can be avoided.

[3]

(e) Part of the hospital's computer package will be an **expert system**. Briefly explain what is meant by the term expert system and suggest **one** task for which it could be used in this situation.

[5]

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B2.(a) Define the term 'operating system'. [2]

(b) List and explain **three** functions of an operating system. [6]

(c) The concept of virtual storage enables programs to be written which are larger than actual memory of the computer.

(i) How does virtual storage work ? [4]

(ii) What disadvantage is there in using virtual storage and why ? [2]

(d) Many personal computers use the Microsoft Disk Operating System - MSDOS. Computers made by Apple use their own operating system. Digital Equipment Corp make the VAX computer which uses the VMS system. If all computers were designed so that they could use the same operating system then there would be some advantages and disadvantages.

(i) Suggest **one** advantage each for the user and software developer. [2]

(ii) Suggest **one** disadvantage for the manufacturer. [2]

(iii) Other than the systems mentioned, there are many other specialised systems. What sort of computer system might need something other than the general purpose systems named ? [1]

(iv) Give **one** reason why it is unlikely that there will ever be a common operating system for all computers. [1]

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B3.

(a) Identify the **three** main activities carried out by a typical data processing department. [3]

(b) Explain the duties and responsibilities of the following personnel:-

(i) computer operations manager [3]

(ii) systems programmer [2]

(iii) application programmer [2]

(iv) file librarian [2]

(c) Name **four** phases in the system development life cycle, and briefly explain them. [8]

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B4. Without files and the permanent storage of data, computer systems would be of much less use.

(a) Explain the terms 'file', 'record' and 'field', and the relationship between them.

[3]

(b) A computer system is being developed for a library to store information about the books and borrowers. Some of the fields stored for each book will be:

International Standard Book Number (ISBN), title, author, location in library; and some of the fields for each lender will be :

membership number, first name, surname, telephone number

(i) Suggest **one** other field which will be needed in the books file and **one** for the members file. Justify your choice for each field.

[4]

(ii) The ISBN is always 10 digits long with the tenth digit being a check digit. What is the purpose of the check digit ?

[2]

(iii) The check digit for ISBN is calculated using the modulus 11 system. Work out what the tenth digit should be for the ISBN 981 3042 02.

[3]

(c) Name and describe **four** categories or types of files used in an information system.

[8]

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B5.

(a) Define the term 'computer bureau'. [2]

(b) List **four** reasons for making use of a computer bureau. [4]

(c) List **three** potential problems an organisation may face if they make use of the bureau's facilities. [3]

(d) Facilities management is an alternative to using a bureau. Briefly explain what this involves and explain why it might be preferable to using a bureau. [3]

(e) Security of computers and the data stored on them is very important. For example, data on the hard disc of a personal computer could be *encrypted*. Explain what is meant by encrypting data. [2]

(f) Suggest **two** other techniques for preventing unauthorised access to data. [2]

(g) Advances in communications technologies mean that it's now easy to have an employee who works at home and dials in to the computer at work to access data files. Why does this make the system potentially less secure ? [2]

(h) Some computer systems are set up so that when a remote user dials in and gives a password, the office based computer automatically disconnects them and then phones back to make the connection to the user at home. Why is this more secure and what disadvantage does it have for the remote user ? [2]

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INFORMATICS

DIPLOMA IN COMPUTER STUDIES

Validated by

University of Cambridge
Local Examinations Syndicate

17 DECEMBER 1995

SW102 • *SOFTWARE AND INFORMATION PROCESSING*

MARK SCHEME

Marks for parts of questions are indicated in brackets after each part of the question.

Only allocate marks as indicated in the mark scheme.

Unless technical terms and definitions are required, accept alternative wording which conveys the same meaning as model answers.

Half marks must not be used unless indicated in the mark scheme.

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SECTION A

[40 marks]

Answer ALL questions in this section.

A1. Explain the difference between the following:- [10]

(a) workfile and masterfile

workfile is a temporary file used for further processing whereas masterfile contains permanent or semi-permanent data used for referencing and updating. [2]

(b) CAD and CAL

CAD stands for computer aided design. It is a term that refers to the integration of computers and graphic-oriented software for the purpose of automating the design and drafting processes whereas CAL stands for computer aided learning and refers to the use of computers for education purposes.[2]

(c) machine code and COBOL

machine code is the lowest level language written in binary form whereas COBOL is a high level language used for business applications. [2]

(d) inserting and appending records

In inserting records, the new record can be placed anywhere in the file whereas in appending, records are placed at the end of the file. [2]

(e) security and privacy of information

security refers to safeguarding and protection of data against unauthorised access, illegal alteration and destruction of data whereas privacy refers to the right of an individual to determine how or to whom the information should be conveyed.

[2]

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A2. List the **four** purposes of documentation. [4]

inter-task, interphase communication

project control/quality control

historical reference

instructional reference

[max 4]

A3. Name the **three** objectives of a database system. [3]

data integration

data integrity

data independence

[max 3]

A4. Distinguish between the following:-

(a) multiprogramming and multiprocessing [4]

multiprogramming is a process where two or more programs are resident in the main memory and are concurrently executed. [2]

multiprocessing is the process whereby two or more instructions are simultaneously executed because of the presence of more than one processor. [2]

(b) schema and subschema [4]

schema is the global view of data and contains the entire information content of the database [2]

whereas subschema is a localised view of the database and refers to part of the information contents. [2]

(c) spooling and interrupt [4]

spooling is a technique of I/O management and this allows I/O devices to continue working at the same time that the CPU is doing work [2]

whereas interrupt is an external event or signal that causes the execution of a program to be suspended temporarily. [2]

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A5. What are the primary duties and responsibilities of a database administrator?

[4]

A database administrator coordinates and carries out all the steps in designing, implementing and maintaining a database. [2]

Ensures data contained in the database meets the information needs of an organisation. [2]

A6. What are the **three** main skills required by a systems analyst ?

[3]

technical skills

communication skills

management skills

[max 3]

A7. Briefly explain why the following are important in the design of a computer system :

(a) input

[2]

- **determines the quality of output (GIGO)** [2]

(b) file organisation

[2]

- **determines the procesing mode (e.g. direct, sequential) that can be implemented** [2]

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SECTION B

[60 marks]

Answer any THREE questions in this section.

B1.

(a) Define the term 'application package'. [2]

Application package is a pre-written program or suite of programs which carries out a particular task [2]

(b) Wordprocessing, spreadsheet and database packages are commonly referred to as general purpose packages. Identify **two** areas in business where specialist application packages are used and describe the type of package used. [4]

Any two areas with software (2 marks each):

Commerce

- Interactive financial planning system is the software package

Manufacturing industry

- Material requirements planning system is the software package

Mathematics

- Statistical analysis system is the software package

Organisations

- Human Resource management software is the software package.

~~[2 marks each]~~ [max 4]

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(c) Explain **two** advantages and **two** disadvantages of using an application package.

[4]

Advantages

Any two { (1 mark each):

i) they are economical, No specialists are required to produce them

ii) Well-documented, easy to use

iii) They are accurate and well-tested before they are released into the market

[max 2]

Disadvantages

Any two { (mark each):

i) Less control over quality of work and service

ii) Needs regular updating

iii) They are not suited to any particular user

[max 2]

(d) A hospital is setting up a new unit to care for babies who have special needs at birth; for example, those who are born too soon. The consultant decides that a computer system will be used to store information about the babies and that a specially written package will be needed.

(i) Apart from normal data entry methods, name two special devices that might be used in the hospital to collect data about the **babies** and state what information they would collect.

[4]

Any two {] :

temperature sensor, record baby's temperature

heart rate monitor, heart rate

colour sensor, colour of baby's skin

air flow monitor, measure volume of air baby is breathing

other suitable example with use

[one mark for device, one mark for information collected]

[max 4]

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(ii) When each baby is admitted to the care unit some information needs to be recorded. One piece of information will be the reason the baby has been admitted such as premature birth or very low birth weight. The computer asks the nurses to enter a short numeric code instead of these descriptions. Suggest **one** reason why the number code is better, **one** problem with using the number code and **one** way in which the problem can be avoided. [3]

number code is better because less likely to be mistyped [1]

wrong code could be typed in ~~error~~ e.g. nurse thinks code 1 is low weight when code 2 ~~is low birth weight~~ should be the correct one [1]

screen could show long description when number is entered so that nurse can confirm correct code [1]

(e) Part of the hospital's computer package will be an **expert system**. Briefly explain what is meant by the term expert system and suggest **one** task for which it could be used in this situation. [3]

Any two (~~one~~ 1 mark each):

an expert system is a computer package which holds an organised base of knowledge

with a carefully designed user interface to allow enquiries

there will be an inference engine which will allow the system to draw conclusions from the answers to questions th esystem asks

there will be a facility to add new knowledge - i.e. to store the results of new questions [max 2]

one task would be to suggest the illness which is causing certain symptoms

other suitable example [max 1]

Any one (1 mark each):

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2.

(a) Define the term 'operating system'.

[2]

An operating system is an organised collection of programs used to manage computer system resources effectively and efficiently. **[2]**

(b) List and explain **three** functions of an operating system.

[6]

Any three

Job scheduling - working out priorities of the jobs

File security and management - OS helps in preventing illegal access or amendments to data files

Logging - keeping track of job execution and hardware use

Accounting - keeping record of resources utilised by each user program and establishing how much processor time a program utilises.

Failure and recovery - OS deals with failures or errors that may occur when the computer is running

Spooling - technique of I/O management which allows I/O devices to continue working at the same time as CPU is doing work

[1 for function, 1 for explanation]
[max 6]

(c) The concept of virtual storage enables programs to be written which are larger than actual memory of the computer.

(i) How does virtual storage work ?

[4]

It permits the central processor to temporarily store instructions or data that are not currently used. **[1]**

on a direct-access storage device **[1]**

on line with the computer **[1]**

these are then brought back into memory when they are needed **[1]**

(ii) What disadvantage is there in using virtual memory and why ?

[2]

The system is much slower because the DASD is slower than immediate access storage

[2]

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(d) Many personal computers use the Microsoft Disk Operating System - MSDOS. Computers made by Apple use their own operating system. Digital Equipment Corp make the VAX computer which uses the VMS system. If all computers were designed so that they could use the same operating system then there would be some advantages and disadvantages.

(i) Suggest **one** advantage each for the user and software developer. [2]

user - makes it easier to learn; can move between systems [1]

software developer - can write one program which works on all systems [1]

or other reasonable examples - one of each

(ii) Suggest **one** disadvantage each for the manufacturer and software developer. [2]

Manufacturer (any one, 1 mark each):

- machine may be optimised to work in a way which the OS does not support

- manufacturer will have to pay OS supplier

other reasonable example 1

[max 1]

Software developer (any one, 1 mark each):

- may require to utilise a system function not available in that single OS 1

[max 1]

– other reasonable example

(iii) Other than the systems mentioned, there are many other specialised systems. What sort of computer system might need something other than the general purpose systems named ? [1]

Real time control systems cannot use a general purpose OS [1]

(iv) Give **one** reason why it is unlikely that there will ever be a common operating system for all computers. [1]

Any one (1 mark each):

manufacturers want to claim that their OS is "better" [1]

different tasks need different systems - real time etc. [1]

any other reasonable explanation [1]

[max 1]

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B3.

(a) Identify **three** main activities carried out by a typical data processing department.

analysis, programming and operations [3]

(b) Explain the duties and responsibilities of the following personnel:-

(i) computer operations manager

Any three (1 mark each): [3]

- **responsible for the conversion of user dept input, scheduling of jobs**
- **ensure the system works smoothly**
- **meets users' needs**
- **ensure computer security**

[max 3]

(ii) systems programmer

[2]

- **evaluates, tests, installs and maintains software components required to support the application programs; monitor and fine tunes the OS to improve performance.**

[2]

(iii) application programmer

[2]

- **assists the systems analyst in establishing the structures and processing logic requirements of the applications system; test and correct logic errors to meet the testing specification established for the system** [2]

(iv) file librarian

Any two (1 mark each): [2]

- **ensures the proper procedure of issuing and recycling media**
- **keeps track of the movement of the media**
- **ensures security in the library**

[2]

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(c) Name **four** phases in the system development life cycle, and briefly explain them. [8]

i) initiation - organisation determines whether there is a need to change the current system

A system analyst is recruited to carry out a feasbility study.

ii) analysis - the analyst defines the objectives of the information system and collects all relevant facts through historical reports, policy statements, procedure manuals, discussion with managers and other operating staff

iii) design - phase where actions of creating the new system are executed so that a fully tested system can be implemented.

iv) testing - develop test plan and carefully selected test data; compare actual with expected test results

v) implementation - changing over from old system to the new system

vi) post-implementation/maintenance- modifications and enhancements are carried out in accordance to changes in government policy or user requirements

vii) review - carried out after a period of life run to determine if system still meets current requirements, may opt to initiate SDLC again.

any four [1 mark for naming, 1 mark for description] [max 8]

B4. Without files and the permanent storage of data, computer systems would be of much less use.

(a) Explain the terms 'file', 'record' and 'field' , and the relationship between them. [3]

A file is a collection of logically related records [1]

A record is a collection of logically related fields [1]

A field is a data item or an attribute of an entity [1]

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(b) A computer system is being developed for a library to store information about the books and borrowers. Some of the fields stored for each book will be:

International Standard Book Number (ISBN), title, author, location in library, and some of the fields for each lender will be:

membership number, first name, surname, telephone number

(i) Suggest **one** other field which will be needed in the books file and **one** for the members file. Justify your choice for each field.

[4]

books file (any one, 1 mark for field + 1 mark for explanation):

code number of current borrower - so that system knows book is on loan

date book is due back - so that system can find overdue books

price - so that if book is lost the loser can be charged for it

any other suitable field and explanation [max 2]

~~**[max 2 - 1 for field and 1 for explanation]**~~

members file (any one, 1 mark for field + 1 mark for explanation):

address - so that they can be contacted if they have overdue books any borrower has

any other suitable field and explanation [max 2]

~~**[max 2 - 1 for field and 1 for explanation]**~~

(ii) The ISBN is always 10 digits long with the tenth digit being a check digit. What is the purpose of the check digit ?

[2]

check digit is there to help verify that the number has been copied correctly

[2]

(iii) The check digit for ISBN is calculated using the modulus 11 system. Work out what the tenth digit should be for the ISBN 981 3042 02.

[3]

9 8 1 3 0 4 2 0 2

10 9 8 7 6 5 4 3 2 x

= 90 + 72 + 8 + 21 + 0 + 20 + 8 +0 + 4 = 223

[1 mark for this calculation]

divide by 11 = 20 remainder 3 **[1 for divide by 11 to get remainder]**

check digit = 11 - 3 = 8 **[1 for subtract from 11 to get CD]**

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(c) Name and describe **four** categories or types of files used in an information system. [8]

four (1 mark for file, 1 mark for description).

Any ~~three~~ with descriptions :

i) master file

a file containing permanent or semi-permanent data used for referencing and updating

ii) transaction file

a file containing source or transaction data used to update the master file

iii) work file

a temporary file used for further processing

iv) transition file

a temporary file created during processing for a specific use.

v) security file

extra copy of a file to guard against damage or loss of current versions.

vi) audit file

a file containing transactions which can be used to identify changes made to master file record contents

[max 8]

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B5.

(a) Define the term 'computer bureau'.

[2]

A computer bureau is a company which operates a computer to process work for other companies.

[2]

(b) List **four** reasons for making use of a computer bureau.

[4]

Any four (1 mark each):

i) obtain valuable initial experience of processing by computer before deciding whether or not to install an inhouse computer.

ii) to provide standby facilitites by arrangement in case of a breakdown of the inhouse computer

iii) to provide facilities for coping with peak data processing loads owing to insufficient capacity of the inhouse computer.

iv) non-availability of finance for the installation of an inhouse computer.

v) space restrictions for accomodating a computer installation

vi) to avoid the responsibility of operating an inhouse computer.

Other acceptable answer

[max 4]

(c) List **three** potential problems an organisation may face if they make use of the bureau's facilities.

Any three (1 mark each):

[3]

i) distance from the user may result in delay or loss of data

ii) loss of control over time

iii) problems of security or confidentiality of data when data is left with an external party.

iv) disruption caused by malfunctioning of bureau's systems

v) service may not be guaranteed if contract expires

vi) inflexible schedules

Other acceptable answer

[max 3]

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(d) Facilities management is an alternative to using a bureau. Briefly explain what this involves and explain why it might be preferable to using a bureau.

[3]

a company transfers all its DP facility to another company [1]

preferable because the other company specialises in DP [1]

and is likely to have plenty of backup equipment and other support [1]

(e) Security of computers and the data stored on them is very important. For example, data on the hard disc of a personal computer could be *encrypted*. Explain what is meant by encrypting data.

[2]

taking the data and applying a mathematical process to it [1]

to generate a coded version which cannot be read without decryption [1]

(f) Suggest **two** other techniques for preventing unauthorised access to data.

Any two (1 mark each);

[2]

physical security - lock up the computer in a special room

use passwords on the programs

any other suitable reason

[max 2]

(g) Advances in communications technologies mean that it's now easy to have an employee who works at home and dials in to the computer at work to access data files. Why does this make the system potentially less secure ?

[2]

any person who finds out the number could dial into the central computer and try to access the files [2]

(h) Some computer systems are set up so that when a remote user dials in and gives a password, the office based computer automatically disconnects them and then phones back to make the connection to the user at home. Why is this more secure and what disadvantage does it have for the remote user ?

[2]

it is more secure because no-one whose number is not stored by the central computer can access it [1]

a user can not dial in from any phone other than their registered phone such as a hotel or other office [1]

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INFORMATICS

DIPLOMA IN COMPUTER STUDIES

Validated by

University of Cambridge
Local Examinations Syndicate

16 DECEMBER 1995
CP103 • *COMPUTER PROGRAMMING*

DURATION : 2 HOURS

INSTRUCTIONS

1. Write your **CANDIDATE NUMBER** and the **MODULE NUMBER AND NAME** clearly on your answer booklet(s).
2. Answer **ALL** questions in Section A and any **THREE** from Section B.
3. Start each question in Section B on a new sheet of paper.
4. The number of marks for each part of a question is indicated in square brackets in the right hand margin.

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SECTION A

[40 marks]

Answer ALL questions in this section.

A1. Give **two** reasons why software projects require documentation.

[2]

A2. Explain what is meant by a Global variable and a Local variable.

[2]

A3. In relation to Data Types what values may a Logical field contain?

[1]

A4. You have been asked to evaluate text processors. State **four** facilities which you would expect to find in a text editor.

[4]

A5.

(a) Explain what is meant by a 'Binary Search'.

[6]

(b) Name **one** sort procedure.

[2]

(c) Illustrate how comparisons are made during a 'Binary Search' to determine the position of the number 20 in the following set of numbers.

2	5	8	12	16	20	32

[2]

(d) How many comparisons would be necessary in a *linear* search ?

[1]

A6. What do the letters JCL represent ? State **three** characteristics of JCL.

[4]

A7. Explain what you understand by the term Application Generator. State **three** advantages of an Application Generator.

[4]

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A8. Define and give **one** example of each of the following terms :

(a) Syntax error

[2]

(b) Logic error

[2]

A9. Give a definition of pseudocode. State **four** advantages of using pseudocode.

[6]

A10. State the difference between "Data Validation" and "Data Verification".

[2]

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SECTION B

[60 marks]

Answer any THREE questions in this section.

B1.

(a) The project on which you are working is nearing completion. It is a major systems development for a chain of supermarkets. The main system is a Stock Control System where stock re-order is fully automated. An Electronic Point of Sales System at customer checkouts is a subsystem which will be linked to the main Stock Control System. All systems and programs have been designed and coded, and individual programs and modules have been tested.

As the analyst responsible for Systems Testing you have been asked to design a systems test plan. Prepare a short paper describing the following test phases and what type of errors they would show : -

(i) Sub system testing [5]

(ii) Full system testing [5]

(iii) Acceptance testing [5]

Give a brief definition of each phase in your answer.

(b) Explain the differences between "white box" testing and "black box" testing. [5]

B2.

Write short notes describing each of these **four** essential features in systems design: -

(a) data description [5]

(b) data communication and security [5]

(c) structured walkthrough [5]

(d) modular design [5]

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B3. Your city has several hundred automated teller machines (ATMS) connected to a network of Banks. When you use a plastic bank card in one of these machines you may make several transactions. A transaction is either a cash withdrawal from your account, instruction for payment of a bill, or a statement of the balance on your bank account.

When you use your bank card in an ATM, it will ask you for your 6 digit private personalised identification number (PIN). The ATM will then ask you what type of transaction you want. If a cash withdrawal is made the ATM will ask you how much. The maximum is $1000.00. If payment of a bill is requested the ATM will prompt for the billing date and payment code. The first two digits of your PIN identify your bank, the remaining four digits represent your account number. When the transaction is processed the four digit ATM number is recorded automatically, together with today's date and time.

(a) Design a simple record layout which would store the information about a transaction, when input in an ATM. Include appropriate field names, data type and data length.

[8]

(b) Describe **four** types of data validation that you would expect to find in processing a transaction as it is input into the ATM.

[8]

(c) Describe **one** design feature of the ATM output screen and **one** design feature of the ATM input console. Explain why these features makes it convenient for the user.

[4]

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B4.

(a) What are the four components of a DECISION TABLE ? [4]

An office supply system is based on the following criteria to derive the quantity of stationery issued to the individual staff of a department:-

```
If the staff privilege = "Head"
        If allowance = "Y" then;
                set quantity issue = basic quantity * headcount + allowance quantity
        else
                set quantity issue = basic quantity * headcount.
        Endif
Else
        If the staff privilege = "Normal"
                If allowance = "Y" then;
                        set quantity issue = Basic quantity + allowance quantity
                else
                        set quantity issue = basic quantity.
                Endif
        Else
                Reject staff privilege
        Endif
Endif
```

(b) Document the above logic using limited or mixed entry decision table. [10]

(c) Give **four** advantages of using a decision table. [4]

(d) Name **two** ways of converting a decision table to a program. [2]

B5. You've just joined a company as their Chief Programmer. You're fairly sure that the program specifications and programs are not fully documented.

(a) Write short notes on what you would expect of the program specifications and program source code, to ensure that programs can be easily maintained. [10]

(b) What contents would you expect to find in a completed program documentation ? [6]

(c) Explain how a user manual is different from an operations manual. [4]

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CP103 • *COMPUTER PROGRAMMING*

MARK SCHEME

Marks for parts of questions are indicated in brackets after each part of the question.

Only allocate marks as indicated in the mark scheme.

Unless technical terms and definitions are required, accept alternative wording which conveys the same meaning as model answers.

Half marks must not be used unless indicated in the mark scheme.

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SECTION A

[40 marks]

Answer ALL questions in this section.

A1. Give **two** reasons why software projects require documentation.

[2]

Any two (1 mark each) :

ensures consistency of application systems developed.

Enhances communication between users and developers.

Facilitates maintenance.

Use as a training aid when training new staff.

[max 2]

A2. Explain what is meant by a Global variable and a Local variable.

[2]

GLOBAL

Variables which are used throughout the whole of a program and its sub-programs, are said to be global to that program. [1]

LOCAL

Variables used within a sub-program and which are neither used nor defined outside that sub-program. [1]

A3. In relation to Data Types what values may a Logical field contain?

True or False **[1]**

[1]

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A4. You have been asked to evaluate text processors. State four facilities which you would expect to find in a text editor.

[4]

Any four (1 mark each) :

Create/edit/save text file

Insert/delete word/sentence/paragraph/page

Search and/or replace word/sentence/paragraph/page

Block copy/move/delete

any suitable editing function [max 4]

A5. (a) Explain what is meant by a 'Binary Search'.

[6]

Data arranged in order

Compare middle item of list

If found, end search

If not found, check if item is on upper or lower part of list.

If on upper list, ignore lower list else ignore upper list.

Treat the remaining list as the original list and repeat operation until found or not found i.e. when the two ends of the list cross over. [max 6]

(b) Name one sort procedure.

[2]

Any one (two marks each) :

Bubble sort

Quick sort

Shell sort [max 2]

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(c) Illustrate how comparisons are made during a 'Binary Search' to determine the position of the number 20 in the following set of numbers.

2	5	8	12	16	20	32

[2]

First search middle position i.e. position 4 with value 12 [1]

Since 20 > 12, then search upper half of set to find mid-position (at position 6, with value 20) [1]

(d) How many comparisons would be necessary in a *linear* search ?

[1]

Answer : 6 [1]

A6. What do the letters JCL represent ? State **three** characteristics of JCL.

[4]

For JOB CONTROL LANGUAGE [max 1]

Characteristics (any three, 1 mark each) :

Job Control Language is a set of commands and relevant information required for the running of a program or job.

Automate the running of several programs in sequence, one after another

Commands includes information like the name of the programs to be run,

the files to be processed and

the channels to be allocated to the input/output devices for data transfer.

[max 3]

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A7. Explain what you understand by the term Application Generator. State **three** advantages of an Application Generator.

[4]

For a definition; award maximum of 1 mark

a program or a set of programs that

provide/generate a fixed logic of certain Data Processing activities

[max 1]

For advantages (any three, 1 mark each) :

- automate file handling
- automate screen definitions
- faster to create applications
- detailed programming knowledge may not be necessary
- other advantages

[max 3]

A8. Define and give **one** example of each of the following terms :

[4]

(a) Syntax error

Errors due to violations of grammatical rules and format of a programming language [1]

Example: Invalid datanames, undefined variables, wrong spelling of keywords [1]

(b) Logic error

Errors due to misunderstanding of requirement or incorrect algorithm, resulting an incorrect results. [1]

Example : Area = Length + Breadth

(Any valid example) [1]

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A9. Give a definition of pseudocode. State **four** advantages of using pseudocode.

[6]

For definition :

- allows programmer to represent logic in a way that Analysts and Programmers understand eg. English

- alternative to flow charting

[max 2]

Four advantages : -

- bridges gap between computer language and analyst/programmer logic
- notation that expresses logic in an understandable manner
- good design tool that provides a model for installation programming standards

- easier to make modifications to source code when program is also represented by pseudocode
any other advantage

[max 4]

A10. State the difference between "Data Validation" and "Data Verification".

[2]

Data validation - checks in program applied to data as it is input/processed to check for accuracy [1]

Data verification - data input independently by another person to ensure that data already input is the same as on the source document/source material [1]

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SECTION B

[60 marks]

Answer any THREE questions in this section.

B1.

(a) The project on which you are working is nearing completion. It is a major systems development for a chain of supermarkets. The main system is a stock control system where stock re-order is fully automated. An Electronic Point of Sales System at customer checkouts is a subsystem which will be linked to the main Stock Control System. All systems and programs have been designed and coded, and individual programs and modules have been tested.

As the analyst responsible for Systems Testing you have been asked to design a systems test plan. Prepare a short paper describing the following test phases and what type of errors they would show : -

(i) Sub system testing

[5]

For definition : - testing of a separate subsystem independently of other systems or subsystems [1]

For types of error and description of phase (any four) :

- **testing designed to isolate errors in subsystem under test**
- **testing main stock system independently of EPOS (or vice versa)**
- **not all errors may be detected, but subsequent testing may**
- **errors in interface between subsystem and others may be found e.g stock update and stock master**
- **analyst should allow for adequate testing time**
- **other valid answer, in relation to subsystem testing**

[max 4]

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(ii) Full system testing

[5]

For definition : - testing of entire system [1]

For description (any four) :

- designed to isolate errors which would only appear as a result of full system test i.e. relationship between subsystems

- e.g. between EPOS and main stock control

- Highlights timing errors
errors of capacity

- other acceptable valid description [max 4]

(iii) Acceptance testing

[5]

For definition : - testing of entire system under controlled environment that is live or based on high volume copies of live data [1]

For description (any four) :

- designed to test for errors that analysts and programmers might not have anticipated

- closely controlled/monitored by users

- results of testing can usually be compared with output from existing/old system

- Acceptance testing highlights problems which would occur in live running e.g. capacity/storage problems unacceptable response times (EPOS)

- Requires high level of cooperation/coordination with systems staff and users

- may take a long time

- other acceptable valid description

[max 4]

Give a brief definition of each phase in your answer.

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(b) Explain the differences between "white box" testing and "black box" testing.

[5]

Any five of the following (1 mark each) :

white box

- interested in individual codes within module

- test data specific

- in highlighting logical errors, if any

black box

- interested in interfaces

- emphasis on input and output results

- test data based on program specs

- no attempt to test codes [max 5]

B2. Write short notes describing each of these four essential features in systems design:-

(a) data description

Any five (1 mark each) :

describes the kind of information that is to be contained

specifies the range of data values

specifies data types e.g. strings, numerics values, etc.

describes the usage of a data

defines linkages between data items, if any

specifies the data structure e.g. sub-fields [max 5]

(b) data communication and security

[5]

Any five (1 mark each) :

must have facilities e.g. input/output of data items

must be able to transfer data without any loss of data values

supports the transfer of entire record structures to and from files

data structures may be used as parameters between program components

must be able to restrict the mode of access

other apt descriptions [max 5]

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(c) structured walkthrough

[5]

Any five (1 mark each) :

- formal review

- participation by peers in programming team

- to highlight errors, not correct them

- points raised are recorded down

- review program, not programmer

- should not last longer than 1 or 2 hours [max 5]

(d) modular design

[5]

Any five (1 mark each) :

- system broken down into well-defined modules

- each performing a pre-determined function

- more easily maintained

- defined modules can be involved by other modules

- allows for modular testing

- easier to isolate bugs [max 5]

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B3. Your city has several hundred automated teller machines (ATMS) connected to a network of Banks. When you use a plastic bank card in one of these machines you may make several transactions. A transaction is either a cash withdrawal from your account, instruction for payment of a bill, or a statement of the balance on your bank account.

When you use your bank card in an ATM, it will ask you for your 6 digit private personalised identification number (PIN). The ATM will then ask you what type of transaction you want. If a cash withdrawal is made the ATM will ask you how much. The maximum is $1000.00. If payment of a bill is requested the ATM will prompt for the billing date and payment code. The first two digits of your PIN identify your bank, the remaining four digits represent your account number. When the transaction is processed the four digit ATM number is recorded automatically, together with today's date and time.

(a) Design a simple record layout which would store the information about a transaction, when input in an ATM. Include appropriate field names, data type and data length.

[8]

A COBOL example is given below. Any suitable data structure format can be accepted. Candidate's answer will differ (in terms of level, data-names).

Sample				Suggested mark points
03	PIN			
	05 BANK_CODE	9(2).	← must be numeric	✓
	05 ACC_CODE	9(4)	← must be numeric	✓
03	TRANS-TYPE	X(1)	← could be X(n) or 9(n)	✓
03	AMOUNT	9(3)V9	← could be separate $, ¢ fields	✓
03	BILLING DATE	← could be 9(6)		
	05 DD	9(2)		
	05 MM	9(2)		
	05 YY	9(2)		
03	PAYMENT CODE	9(6)	← May be numeric or string	✓
03	ATM_CODE	9(4)	←MUST be numeric	✓
03	TRANS_DATE	9(6)		✓
03	TRANS_TIME	9(4)	←FOR HH:MM OR 9(6) HH:MM:SS	✓

[max 8]

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(b) Describe **four** types of data validation that you would expect to find in processing a transaction as it is input into the ATM.

[8]

For validation (any four, 2 marks each) :

- PIN NO input : **check numeric**
check valid

- Transaction type : **check valid value alpha/numeric**

- Amount : **numeric**

within range limit

- Bill payment date : **valid date**

today or future date only

- Bill payment Account : Check numeric/valid

- ATM code, Date and time, automatically supplied by ATM - no checks needed

Other valid cross validation checks

[max 8]

(c) Describe **one** design feature of the ATM output screen and **one** design feature of the ATM input console. Explain why these features makes it convenient for the user.

[4]

output screen (any one) :

- not too many messages per screen

so that user does not need to remember multiple instructions

- any other feature

(1 mark for feature, 1 mark for explanation) [max 2]

input console (any one) :

- input buttons placed on left and right of screen

so that user can directly associate screen instruction with correct input button

- any other feature

(1 mark for feature, 1 mark for explanation) [max 2]

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B4.

(a) What are the **four** components of a DECISION TABLE ?

[4]

condition stub

condition entry

action stub

action entry

[max 4]

An office supply system is based on the following criteria to derive the quantity of stationery issued to the individual staff of a department:-

```
If the staff privilege = "Head"
        If allowance = "Y" then;
                set quantity issue = basic quantity * headcount + allowance quantity
        else
                set quantity issue = basic quantity * headcount.
        Endif
Else
        If the staff privilege = "Normal"
                If allowance = "Y" then;
                        set quantity issue = Basic quantity + allowance quantity
                else
                        set quantity issue = basic quantity.
                Endif
        Else
                Reject staff privilege
        Endif
Endif
```


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(b) Document the above logic using limited or mixed entry decision table.

[10]

Sample :

	1	2	3	4	5
privilege = "Head"	Y	Y	N	N	N
privilege = "Normal"	N	N	Y	Y	N
Allowance	Y	N	Y	N	-
quantity issue = basic quantity * headcount + allowance quantity	X	-	-	-	-
quantity issue = basic quantity * headcount.	-	X	-	-	-
quantity issue = Basic quantity + allowance quantity	-	-	X	-	-
set quantity issue = basic quantity.	-	-	-	X	-
Reject Staff Privilege					X

Limited entries with 8 rules also acceptable (i.e. not combined)

Award 2 marks for correct table construct layout [max 2]

Award 1 mark for each complete and correct conditions entry [max 3]

1 mark for each complete and correct actions entry [max 5]
(extended entries for actions also acceptable)

Award marks for showing understanding of questions though answers may not be fully correct.

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(c) Give **four** advantages of using a decision table.

[4]

Any four (1 mark each) :

Enables us to do a complete check

Excellent documentation for communication among systems analyst, programmer and management

Uses a logical approach and can handle complex logic well

Can be learnt easily

Can be translated directly into computer programs.

[max 4]

(d) Name **two** ways of converting a decision table to a program.

[2]

Any two (1 mark each) :

Coding from the table by hand

Using a pre-processor which converts the table into a source program suited for input to a compiler

Using a program which interprets the table

Using a special compiler to translate the decision table into machine code.

[max 2]

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B5. You've just joined a company as their Chief Programmer. You're fairly sure that the program specifications and programs are not fully documented.

[10]

(a) Write short notes on what you would expect of the program specifications and program source code to ensure that programs can be easily maintained.

For expected features, up to a maximum of 5

i) Use meaningful data names

ii) Inclusion of comment statements

iii) Layout - indentation etc.

iv) Use simple techniques

v) Use sensible program structures

vi) Avoid FANCY code

vii) Well documented

[max 5]

For valid reasons, for each feature chosen up to a maximum of 5 [max 5]

(b) What contents would you expect to find in a completed program documentation ?

[6]

Any six (1 mark each) :

i) Description of function

ii) File layouts, screen formats, printer layouts

iii) Listings with comments

iv) Sample output/expected results, actual results

v) List of input types/test data

vi) Program structure diagram/flowcharts

vii) Decision tables

viii) List of amendments

ix) Console messages

x) Test-plan, text log

[max 6]

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(c) Explain how a user manual is different from an operations manual. [4]

Any four (1 mark each) :

- **user manual instructs on the usage of the software**
- **operations manual instruct on the maintenance of the software**
- **user manual guides general user**
- **operations manual guides technical members of the EDP department**
- **user manual lists basic simple-to-follow instructions**
- **operations manual assumes programming knowledge** [max 4]

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INFORMATICS

DIPLOMA IN COMPUTER STUDIES

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9 DECEMBER 1995

RM104 • *COMPUTER RELATED MATHEMATICS AND STATISTICS*

DURATION : 2 HOURS

INSTRUCTIONS

1. Write your **CANDIDATE NUMBER** and the **MODULE NUMBER AND NAME** clearly on your answer booklet(s).
2. Answer **ALL** questions in Section A and any **THREE** from Section B.
3. Start each question in Section B on a new sheet of paper.
4. The number of marks for each part of a question is indicated in square brackets in the right hand margin.

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SECTION A

[40 marks]

Answer ALL questions in this section.

A1. Convert the following : (You MUST show all workings)

(a) 87A Hexadecimal to Denary **[2]**

(b) 208 Denary to Binary **[2]**

(c) 434 Octal to Binary **[2]**

(d) 565 Octal to hexadecimal **[2]**

A2.

Given $A = \begin{bmatrix} -1 & 0 & 2 \\ 0 & 5 & 4 \\ 1 & 8 & -2 \end{bmatrix}$ and $B = \begin{bmatrix} 0 & -1 & -1 \\ 2 & 1 & 3 \\ 1 & -2 & 0 \end{bmatrix}$,

Prove that $AB \neq BA$. **[6]**

A3. Given

Item	Cost
Printer	2y
Monitor	y
Computer System	5x
Scanner	x

and also given that the angle for x in a pie chart for the above is 15^o and that total cost is 4500, solve for x and y. **[4]**

A4. Using Boolean Algebra prove $\overline{A(B+\overline{AC})} + \overline{AC + \overline{A}\overline{B}C + BC} = \overline{A} + \overline{B} + \overline{C}$ **[5]**

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A5. Using modulus 11 and weightings of 2, 3, and 4 for the units, tens, and hundreds columns :

(a) Create a check digit for 834

[2]

(b) Show that the check digit method is able to identify the transposition error 843

[2]

A6. Solve for x and y, given

$2x + 3y = 20$

$3x - 2y = 30$

[3]

A7. Use a Venn Diagram to represent the following :

(a) $A \cup (B \cup C)'$

[3]

(b) $(A \cap B') \cup (A \cap C)$

[3]

A8. Given a series of numbers : c, 5, 6, 8, 12, 25, and that the mean of these numbers is 15:

(a) Find c

[2]

(b) Find the median

[2]

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SECTION B

[60 marks]

Answer any THREE questions in this section.

B1. The distribution of a product's rating obtained in a survey is given by :

Marks	1-20	21-40	41-60	61-80	81-100	101-120	121-140
Freq	6	8	14	10	20	22	10

(a) On graph paper draw a histogram representing this distribution.

[4]

(b) Calculate, by tabulation

(i) the mean rating to 2 decimal places

[5]

(ii) the standard deviation to 2 decimal places

[3]

(c) Construct a cumulative frequency table

[2]

(d) Plot the cumulative frequency curve on a graph paper

[4]

(e) Estimate from the graph

(i) the median.

(ii) the upper quartile

[2]

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B2. A, B , C are switches in an electrical circuit.

If a switch is on, it has a boolean value '1'; otherwise it has value '0'.

The light bulb, X, will light (i.e have boolean value '1')

if A = 1 and only one of B or C = 1,

or if A = 1 and B and C = 0

(a) Draw a truth table relating the input of A , B and C to output X

[5]

(b) Write down the expression, but do not simplify, for X.

[3]

(c) Simplify the expression using a Karnaugh map.

[4]

(d) Draw the logic circuit for the above simplified expression.

[4]

(e) Redesign the logic circuit for the above simplified expression using 2-input NAND gates only.

[4]

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B3.

(a) A basket contains 8 oranges and 2 pears. The fruits are picked at random from the basket, one after another. Assuming the fruits are not replaced:

(i) Draw a probability tree to show the possible outcomes of three picks

[7]

(ii) Find the probability of picking an orange, a pear and an orange in that order

[2]

(iii) Find the probability of picking at least 2 oranges

[3]

(b) Recalculate (i), (ii), and (iii) above assuming the fruits are picked with replacement.

[8]

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B4.

(a) If a computer stores integers in an 8 bit register using two's complement

(i) How would the computer evaluate -14 - 125 ? Show all your working.

[4]

(ii) Comment on the correctness of your results

[2]

(b) A floating point number is stored in normalised form using a 16-bit word, with the first bit reserved as the sign for the mantissa, and the last 6 bits reserved for the exponent in two's complement. The remaining bits are for the mantissa itself.

(i) Express -16.875 in this form

[4]

(ii) Express -0.09375 in this form

[4]

(c) Given two numbers, 207 and 199 :

(i) express them in BCD

[2]

(ii) add these BCD numbers and justify that your answer is correct

[4]

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B5.

Given that $Y = x^2 - 4x + 3$

(a) Construct a table of values for the integer range from $x = -1$ to $x = 4$ inclusive.

[3]

(b) Plot the points on graph paper and draw the curve.

[5]

(c) On the same graph , draw the line $Y = -2x + 7$

[4]

(d) From the graph, estimate the solution for :

(i) $x^2 - 4x + 3 = 0$

(ii) $x^2 - 4x + 3 = -2x + 7$

[4]

(e) Shade and label the region(s) satisfying all the following conditions :

(i) $-1 =< x <= 4$

(ii) $Y <= x^2 - 4x + 3$

(iii) $Y >= 0$

[4]

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RM104 • *COMPUTER RELATED MATHEMATICS AND STATISTICS*

MARK SCHEME

Marks for parts of questions are indicated in brackets after each part of the question.

Only allocate marks as indicated in the mark scheme.

Unless technical terms and definitions are required, accept alternative wording which conveys the same meaning as model answers.

Half marks must not be used unless indicated in the mark scheme.

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SECTION A

[40 marks]

Answer ALL questions in this section.

A1. Convert the following : (You MUST show all workings) [8]

(a) 87A Hexadecimal to Denary

$87A = 8 * 16^2 + 7 * 16^1 + 10 * 1$ [1]

$= 2170$ [1]

(b) 208 Denary to Binary

2	208	Remainder
2	104	0
2	52	0
2	26	0
2	13	0
2	6	1
2	3	0
2	1	1
2	0	1

[1]

208 = 11010000 Binary [1]

(c) 434 Octal to Binary

434 octal = 100 011 100 Binary [2]

(d) 565 Octal to hexadecimal

565 Octal = 101 110 101 Binary [1]

175 Hexadecimal [1]

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A2.

Given $A = \begin{bmatrix} -1 & 0 & 2 \\ 0 & 5 & 4 \\ 1 & 8 & -2 \end{bmatrix}$ and $B = \begin{bmatrix} 0 & -1 & -1 \\ 2 & 1 & 3 \\ 1 & -2 & 0 \end{bmatrix}$,

Prove that $AB \neq BA$.

[6]

$$AB = \begin{bmatrix} -1 & 0 & 2 \\ 0 & 5 & 4 \\ 1 & 8 & -2 \end{bmatrix} * \begin{bmatrix} 0 & -1 & -1 \\ 2 & 1 & 3 \\ 1 & -2 & 0 \end{bmatrix}$$

$$= \begin{bmatrix} -1*0+0*2+2*1 & -1*-1+0*1+2*-2 & -1*-1+0*3+2*0 \\ 0*0+5*2+4*1 & 0*-1+5*1+4*-2 & 0*-1+5*3+4*0 \\ 1*0+8*2+-2*1 & 1*-1+8*1+-2*-2 & 1*-1+8*3+-2*0 \end{bmatrix} \quad [1]$$

$$= \begin{bmatrix} 2 & -3 & 1 \\ 14 & -3 & 15 \\ 14 & 11 & 23 \end{bmatrix} \quad [2]$$

$$BA = \begin{bmatrix} 0 & -1 & -1 \\ 2 & 1 & 3 \\ 1 & -2 & 0 \end{bmatrix} * \begin{bmatrix} -1 & 0 & 2 \\ 0 & 5 & 4 \\ 1 & 8 & -2 \end{bmatrix}$$

$$= \begin{bmatrix} 0*-1+-1*0+-1*1 & 0*0+-1*5+-1*8 & 0*2+-1*4+-1*-2 \\ 2*-1+1*0+3*1 & 2*0+1*5+3*8 & 2*2+1*4+3*-2 \\ 1*-1+-2*0+0*1 & 1*0+-2*5+0*8 & 1*2+-2*4+0*-2 \end{bmatrix} \quad [1]$$

$$= \begin{bmatrix} -1 & -13 & -2 \\ 1 & 29 & 2 \\ -1 & -10 & -6 \end{bmatrix} \quad [2]$$

Thus AB not = BA (Proved)

NB to prove inequality, a candidate only needs to show that <u>one</u> difference exists.

Top left of AB is -1 * 0 + 0 * 2 + 2 * 1 = 2

Top left of BA is 0 * -1 + -1 * 0 + -1 * 1 = -1

2 ≠ -1 so AB ≠ BA

This short cut method should still get full-marks.

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A3. Given

Item	Cost
Printer	2y
Monitor	y
Computer System	5x
Scanner	x

and also given that the angle for x in a pie chart for the above is 15^o and that total cost is 4500, solve for x and y.

[4]

2y + y + 5x + x = 4500

3y + 6x = 4500 [1]

y + 2x = 1500 **eqn 1**

x/4500 * 360 = 15 [1]

x = 187.5 [1]

y = 1500- 2(187.5)

= 1125 [1]

A4. Using Boolean Algebra prove $\overline{A(B+\overline{AC})}+\overline{AC+\overline{A}\overline{B}C+BC}=\overline{A}+\overline{B}+\overline{C}$

[5]

$\overline{A(B+\overline{AC})}+\overline{AC+\overline{A}\overline{B}C+BC}=\overline{A}+\overline{B}+\overline{C}$

$=\overline{A}+\overline{(B+\overline{AC})}+\overline{C(A+\overline{A}\overline{B}+B)}$ [1]

$=\overline{A}+\overline{B}.AC+\overline{C\left(A+\overline{A}+\overline{B}+B\right)}$ [1]

$=\overline{A}+A\overline{B}C+\overline{C(1+1)}$ [1]

$=\overline{A}+A\overline{B}C+\overline{C}$ [1]

$=\overline{A}+\overline{C}+A\overline{B}$ [1]

$=\overline{A}+\overline{B}+\overline{C}$ [1]

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A5. Using modulus 11 and weightings of 2, 3, and 4 for the units, tens, and hundreds columns,

(a) Create a check digit for 834

[2]

sum = 8*4 + 3*3 + 4 * 2 = 49

remainder = 49 mod 11 = 5 **[1]**

Check digit = 11 - 5 = 6 **[1]**

(b) Show that the check digit method is able to identify the transposition error 843

[2]

eg of transposition error : 843

sum = 8 * 4 + 4 *3 + 3 * 2 = 50

remainder = 50 mod 11 = 6 **[1]**

check digit = 11 - 6 = 5 **[1]**

A6. Solve for x and y, given

$2x + 3y = 20$

$3x - 2y = 30$

[3]

2x + 3y = 20 eqn 1

3x - 2y = 30 eqn 2

6x + 9y = 60 eqn 3 (from eqn 1 * 3)

6x - 4y = 60 eqn 4 (from eqn 2 * 2) **[1]**

---

13 y = 0 eqn 4 - eqn 3

y = 0 **[1]**

Subst y = 0 into eqn 1

x = 20/2 = 10 **[1]**

[Any correct method should get the marks]

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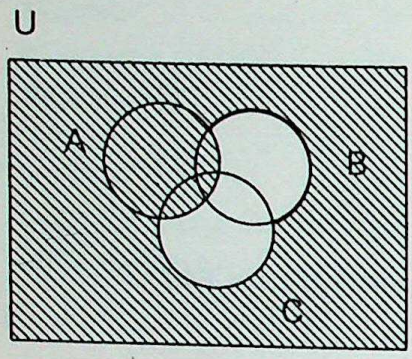
A7. Use a Venn Diagram to represent the following :

(a) $A \cup (B \cup C)'$

[3]

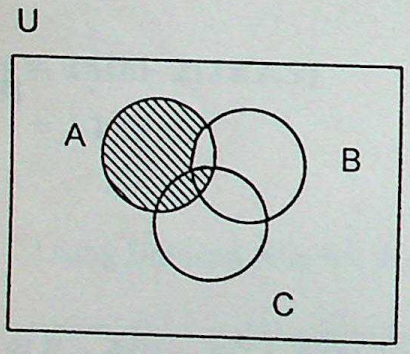


[1] for labelling

[2] for correct shading

(b) $(A \cap B') \cup (A \cap C)$

[3]



[1] for labelling

[2] for correct shading

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A8. Given a series of numbers : c, 5, 6, 8, 12, 25, and the mean of these numbers is 15:

(a) Find c

[2]

15 = (5 + 6 + 8 + 12 + c + 25) / 6 [1]

15 = (56 + c) / 6

c = 15* 6 - 56

c = 34 [1]

(b) Find the median

[2]

Series (in sequence) : 5, 6, 8, 12, 25, 34

Median : middle term = (8 + 12) / 2 [1]

= 10 [1]

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SECTION B

[60 marks]

Answer any THREE questions in this section.

B1. The distribution of a product's rating obtained in a survey is given by :

Marks	1-20	21-40	41-60	61-80	81-100	101-120	121-140
Freq	6	8	14	10	20	22	10

(a) On graph paper draw a histogram representing this distribution. [4]

Refer to graph

(b) Calculate, by tabulation [8]

Rating	x	f	d	fd	fd^2
1-20	10.5	6	-100	-600	60000
21-40	30.5	8	-80	-640	51200
41-60	50.5	14	-60	-840	50400
61-80	70.5	10	-40	-400	16000
81-100	90.5	20	-20	-400	8000
101-120	110.5	22	0	0	0
121-140	130.5	10	20	200	4000
		Σf =90		Σfd =-2680	Σfd^2=189600
		[1]	[1]	[1]	[1]

fx	fx^2
63	661.5
244	7442.0
707	35703.5
705	49702.5
1810	163805.0
2431	268625.5
1305	170302.5
Σfx = 7265	Σfx^2 = 696242.5

(full marks given if fx and Σfx used, without deriving d or Σfd)

(i) the mean rating to 2 decimal places

$$\frac{\Sigma fd}{\Sigma f} + x_o = \frac{-2680}{90} + 110.5 \quad \text{or} \quad \frac{\Sigma fx}{\Sigma f} = \frac{7265}{90} \qquad [1]$$

$= 80.72$ $= 80.72$ [1]

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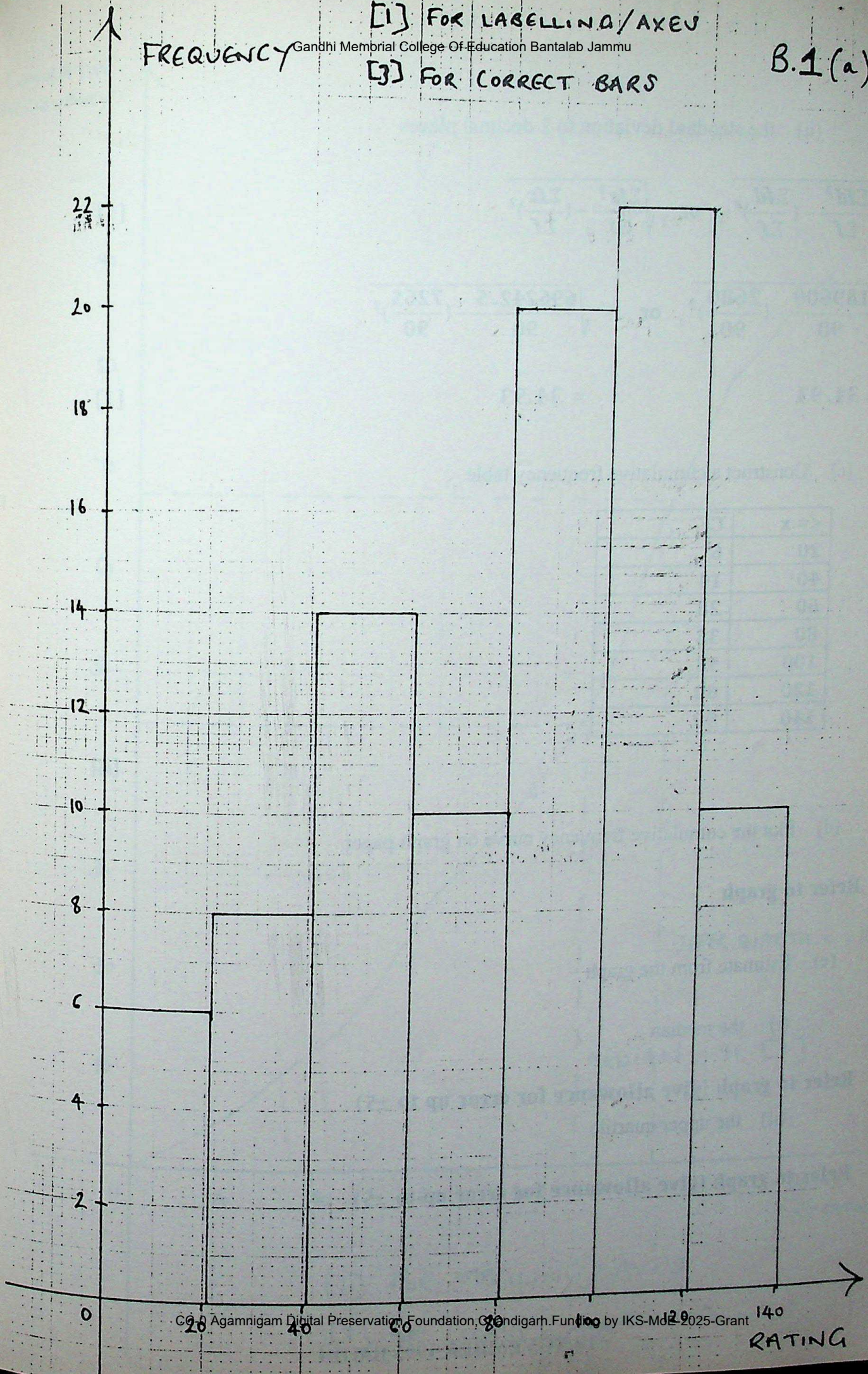
[1] FOR LABELLING/AXES

[3] FOR CORRECT BARS

B.1(a)



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(ii) the standard deviation to 2 decimal places

$\sqrt{\frac{\Sigma fd^2}{\Sigma f} - (\frac{\Sigma fd}{\Sigma f})^2}$ **or** $\sqrt{\frac{\Sigma fx^2}{\Sigma f} - (\frac{\Sigma fx}{\Sigma f})^2}$ **[1]**

$= \sqrt{\frac{189600}{90} - (\frac{2680}{90})^2}$ **or** $= \sqrt{\frac{696242.5}{90} - (\frac{7265}{90})^2}$

$= 34.93$ $= 34.93$ **[1]**

(c) Construct a cumulative frequency table

[2]

<= x	CF
20	6
40	14
60	28
80	38
100	58
120	80
140	90

[2]

(d) Plot the cumulative frequency curve on graph paper

[4]

Refer to graph

(e) Estimate from the graph :

(i) the median

[1]

Refer to graph (give allowance for error up to ±5)

(ii) the upper quartile

[1]

Refer to graph (give allowance for error up to ±5)

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B1 (d), (e)

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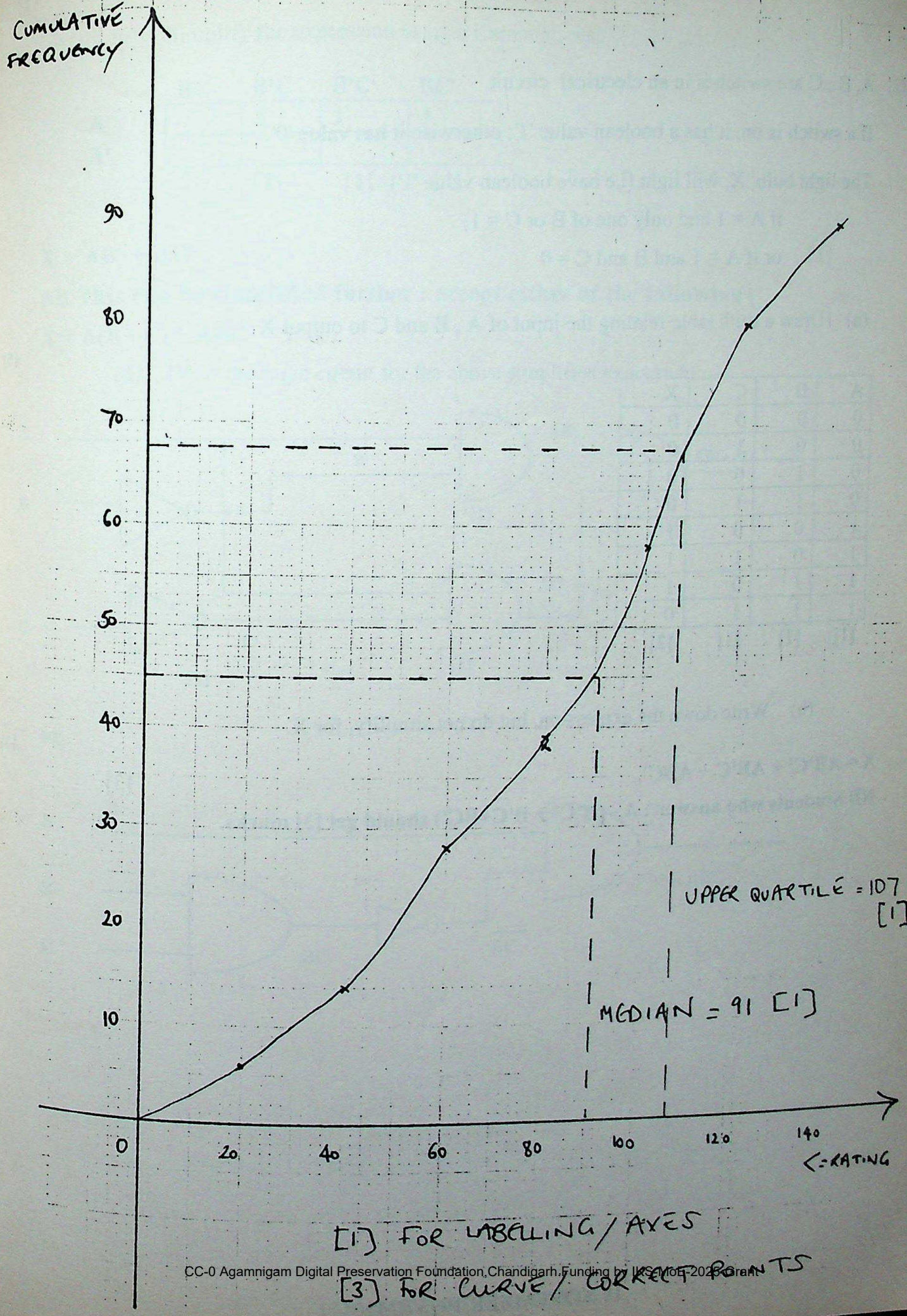

[1] FOR LABELLING / AXES

[3] FOR CURVE / CORRECT POINTS

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B2. A, B , C are switches in an electrical circuit.

If a switch is on, it has a boolean value '1'; otherwise it has value '0'.

The light bulb, X, will light (i.e have boolean value '1')

if A = 1 and only one of B or C = 1,

or if A = 1 and B and C = 0

(a) Draw a truth table relating the input of A , B and C to output X

[5]

A	B	C	X
0	0	0	0
0	0	1	0
0	1	0	0
0	1	1	0
1	0	0	1
1	0	1	1
1	1	0	1
1	1	1	0
[1]	**[1]**	**[1]**	**[2]**

(b) Write down the expression, but do not simplify, for X.

[3]

X = AB'C' + AB'C + ABC'

[3]

NB Students who answer : A - (B'C' + B'C+BC') should get [3] marks.

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(c) Simplify the expression using a Karnaugh map. [4]

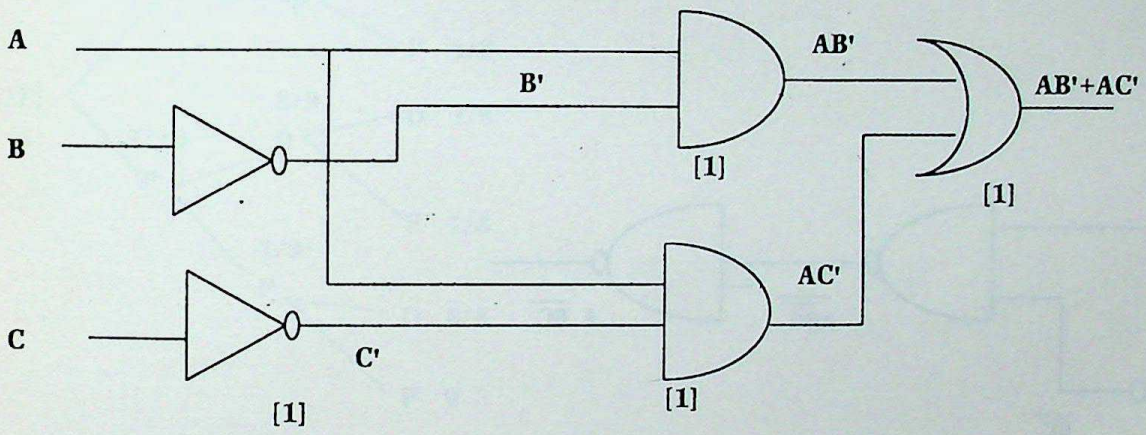
	BC	B'C	B'C'	BC'
A		1	1	1
A'				
		[1]	[1]	[1]

X = AB' + AC' **[1]**

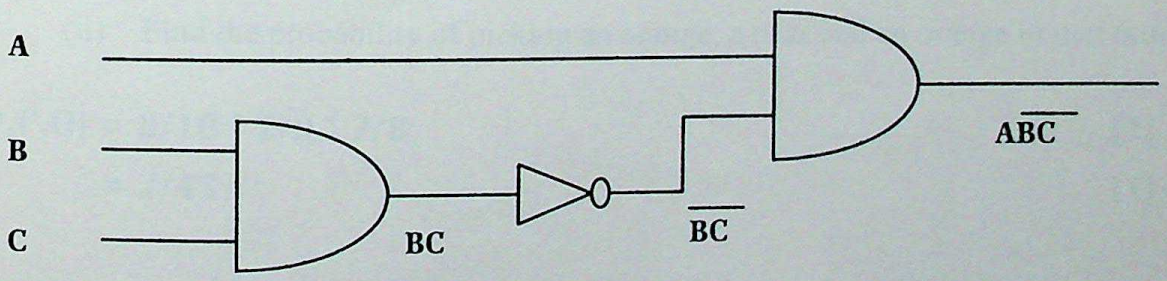
NB This can be simplified further : accept either of the following :

$X = A(\overline{B} + \overline{C}) = A\overline{BC}$

(d) Draw the logic circuit for the above simplified expression. [4]



or



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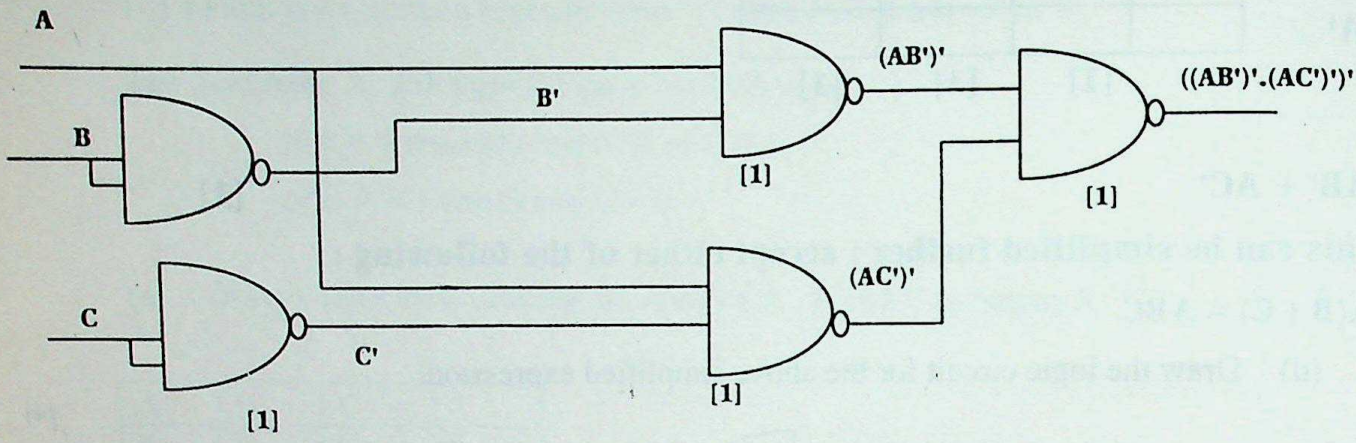
(e) Redesign the logic circuit for the above simplified expression using 2-input NAND gates only. [4]



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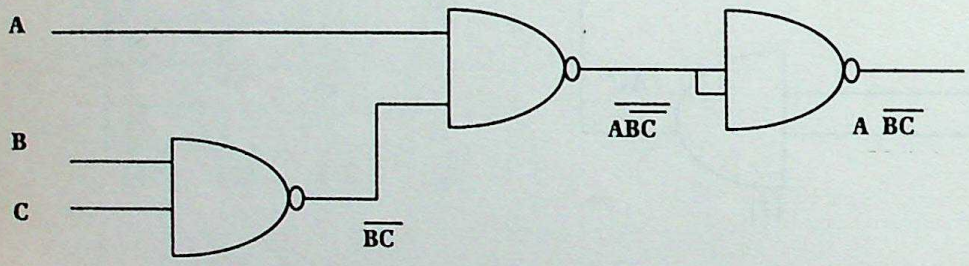

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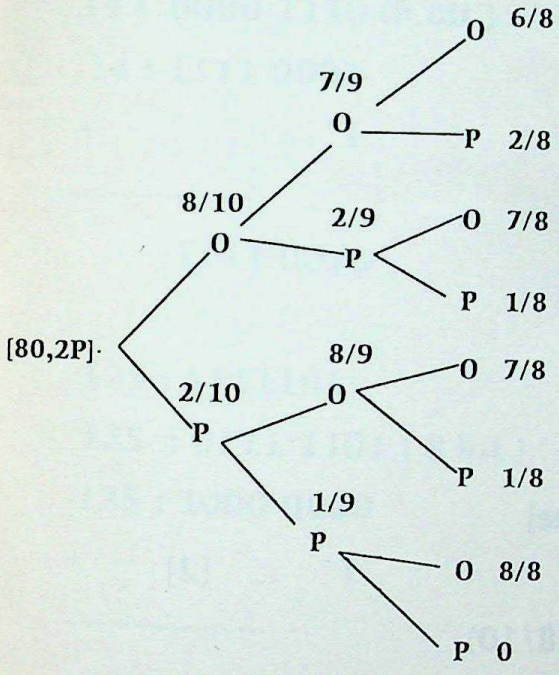
B3.

(a) A basket contains 8 oranges and 2 pears. The fruits are picked at random from the basket, one after another. Assuming the fruits are not replaced:

[7]

(i) Draw a probability tree to show the possible outcomes of three picks



[½] for each non-root node

[max 7]

(ii) Find the probability of picking an orange, a pear and an orange in that order

[2]

P(O,P,O) = 8/10 * 2/9 * 7/8 **[1]**

= 7/45 **[1]**

(iii) Find the probability of picking at least 2 oranges.

[3]

P(at least 2 O) = 3*P(OOP) + P(OOO) = (3*(8*7*2)+ (8*7*6)) / 10*9*8 = 42/45 or 14/15

[1] [1] [1]

alternatively

P (at least 2 O) = 1 - P(2P) = 1-3*P(PP)=1-(3*2*1)/(10*9) = 1-3/45 = 42/45 or 14/15

[1] [1] [1]

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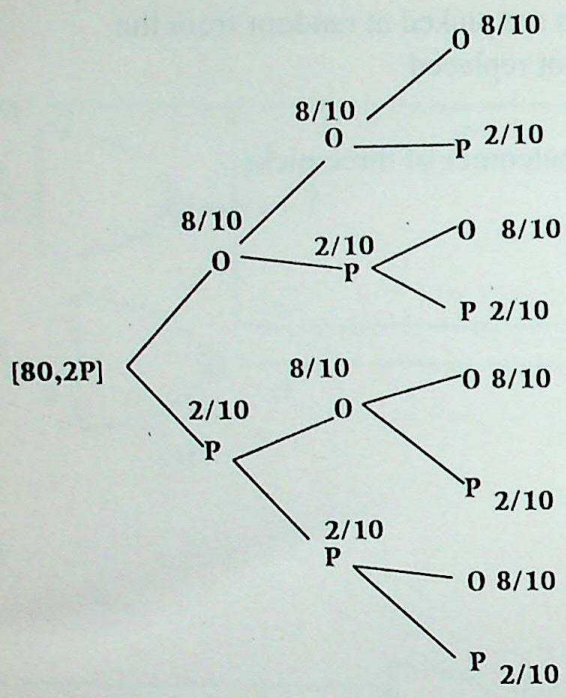
(b) Recalculate (i), (ii), (iii) above assuming the fruits are picked with replacement. [8]



[1] [1] [1] and [1 for correct tree]

(ii) P(OPO) = 8/10 * 2/10 * 8/10 = 16/125 [2]

(iii) P(at least 2 O) = 3*(16/125) + (8/10*8/10*8/10)

= 112/125 [2]

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B4.

(a) If a computer stores integers in an 8 bit register using two's complement

(i) How would the computer evaluate -14 - 125 ? You must show all working.

[4]

14 : 1110

14 : 0000 1110 (8 bit)

-14 : 1111 0001

+ 1

1111 0010 **[1]**

[1]

125 : 1111101

125 : 0111 1101 (8 bit)

-125 : 1000 0010

+ 1

10000011 **[1]**

-14 : 1111 0010

-125 : 1000 0011

+

0111 0101 **[1]**

(ii) Comment on the correctness of your results

[2]

01110101 = 117 , not equal to correct answer -139, overflow occurs [2]

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(b) A floating point number is stored in normalised form using a 16-bit word, with the first bit reserved as the sign for the mantissa, and the last 6 bits reserved for the exponent in two's complement. The remaining bits are for the mantissa itself.

(i) Express -16.875 in this form [4]

-16.875

16 : 10000

0.875 : 0.111

-16.875 = -(10000.1110) **[1]**

= -0.100001110 x 2^5 **[1]**

1 100001110 000101

sign mantissa exponent **[2]**

(ii) Express -0.09375 in this form [4]

-0.09375 =-0.00011 **[1]**

= -0.110000000 x 2^{-3} **[1]**

exponent : -3 : -000011

111100

+ 1

111101 **[1]**

1 110000000 111101

sign mantissa exponent **[1]**

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(c) Given two numbers 207 and 199

(i) express them in BCD

[2]

207: 0010 0000 0111 [1]

199: 0001 1001 1001 + [1]

(ii) add these BCD numbers and justify that your answer is correct

[4]

406 : 0011 1010 0000 [1]

0110 0110 + [1]

0100 0000 0110 [1]

↓ ↓ ↓

4 0 6 [1]

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B5. Given that $Y = x^2 - 4x + 3$

(a) Construct a table of values for the integer range from x = - 1 to x = 4 inclusive.

[3]

x	-1	0	1	2	3	4
Y	8	3	0	-1	0	3

[1 mark for every two correct]

[max 3]

(b) Plot the points on graph paper and draw the curve.

[5]

Refer to graph

[5]

(c) On the same graph , draw the line $Y = -2x + 7$

[4]

x	0	3.5
y	7	0

(accept any other two correct co-ordinates)

[1]

Refer to graph

[3]

(d) From the graph, estimate the solution for :

[2]

(i) $x^2 - 4x + 3 = 0$

x = 1

or

x = 3

[1] each

[2]

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(ii) $x^2 - 4x + 3 = -2x+7$

[2]

x = 3.25

or

x = -1.23

[1] each give allowance of error ±0. 3 [2]

(e) Shade and label the region(s) satisfying all the following conditions :

[4]

(i) $-1 =< x <= 4$

(ii) $Y <= x^2 - 4x + 3$

(iii) $Y >= 0$

Refer to graph

[2 marks for each correct region] [max 4]

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Question 5.

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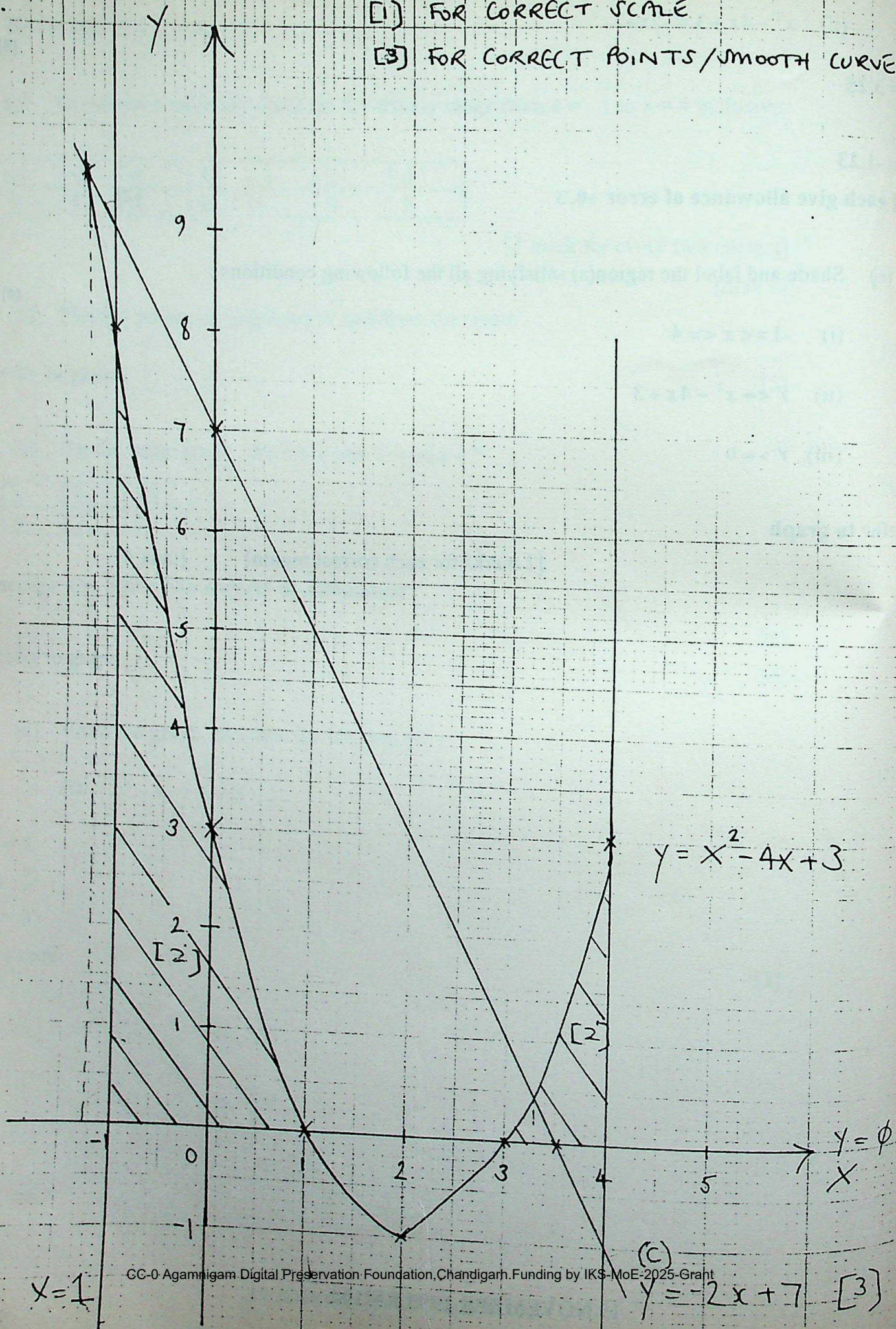
(b) [1] FOR LABELLING / AXES

[1] FOR CORRECT SCALE

[3] FOR CORRECT POINTS / SMOOTH CURVE



(c)

$x = 1$

$y = -2x + 7$ [3]

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INFORMATICS

DIPLOMA IN COMPUTER STUDIES

Validated by

University of Cambridge Local Examinations Syndicate

10 DECEMBER 1995

BT105 • *BUSINESS STUDIES*

DURATION : 2 HOURS

INSTRUCTIONS

1. Write your **CANDIDATE NUMBER** and the **MODULE NUMBER AND NAME** clearly on your answer booklet(s).
2. Answer **ALL** questions in Section A and any **THREE** from Section B.
3. Start each question in Section B on a new sheet of paper.
4. The number of marks for each part of a question is indicated in square brackets in the right hand margin.

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SECTION A

[40 marks]

Answer ALL questions in this section.

A1. Briefly explain the following four terms:

(a) Span of control

(b) Chain of command

(c) Accountability

(d) Standardisation

[4]

A2. State **four** reasons for change in the workplace.

[4]

A3.

(a) Give a definition of 'Organisation Structure'.

[2]

(b) Line Relationship is one type of organisation structure. Name **two** other types.

[2]

A4. State the purpose of each of the following :

(a) Pay Slip

[1]

(b) Gantt Chart

[1]

A5. List **four** major contents of the minutes of a meeting.

[4]

A6. The 'Classical' approach is one approach to organisational design.

The 'Systems' approach is another. State **seven** benefits obtained from a Systems Approach.

[7]

A7. Organisations may have centralised or decentralised control.

State **three** disadvantages of centralised control.

[3]

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A8. Planning is one functional area of management. State, and briefly describe, **four** other functional areas of management.

[8]

A9. Outline what is involved in Segmentation Analysis.

[4]

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SECTION B

[60 marks]

Answer any THREE questions in this section.

B1. You have been asked to give to a group of managers a short presentation entitled "The Scientific Management Movement - Taylor's contribution to management, and its relevance to today's manager".

Write a brief **report** describing the principles of scientific management proposed by Taylor, and the relevance of these principles to management today.

[20]

B2. You've recently joined the Human Resources Division of a local company and, as part of your job, your boss Mr Wong has asked you to review:-

(a) the legal obligations of the company in respect of the Health, Safety and Welfare of employees,

(b) the procedures for storage of information in the company's computer

(c) the security of files and documents in the Personnel Department

(d) safeguards for ensuring the security of petty cash in the accounts department.

Before you start your investigations write a **memorandum** to your boss outlining what measures you would expect to find already in place for ensuring the safety and security issues described above.

[20]

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B3. You have been asked to conduct a feasibility study concerning the introduction of computer systems into Brasiliad Ltd, an advertising agency with two offices in Rio de Janeiro, Brazil. The Head Office has 15 staff: a Managing Director (MD) and Personal Assistant, 5 staff who design advertising text and graphics, 4 staff in the Accounts Department, 2 staff in Personnel, and 2 in Marketing. The Sales Office is 10 kilometres from the Head Office and has 5 staff, all involved in selling advertising services. Staff in both offices work closely together at meetings, and on the telephone. There is a PC in the MD's office but it is rarely used. Apart from this, Brasiliad has no other computing equipment.

Prepare a brief **memorandum** for the MD of Brasiliad indicating:-

(a) the benefits of computerising their agency

(b) the areas in which computer systems could be implemented

(c) the issues that the agency will need to face if computerised systems are introduced.

[20]

B4. DataCo Pte is a software house specialising in the design, programming and implementation of computer systems for its clients. At any given time it may have several clients. Analysts and Programmers are assigned to Project Teams according to their technical skills, business knowledge and their availability to work on a project. A Project Manager has one project to manage. Analysts and Programmers may however be working on several projects, each with its own Project Manager.

Write a brief **report** which:-

(a) states the type of organisational structure described above

(b) describes the advantages and disadvantages of this type of organisational structure

(c) comments on whether any other organisational structure would be more appropriate for DataCo.

[20]

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B5. Athena Insurance Ltd is a large insurance company based in Athens, Greece. It provides worldwide insurance cover for shipping, issuing hundreds of insurance policies and processing hundreds of claims each year. By law it is required to keep permanently all original documents or authorised copies, even for insurance policies which are out of date. As a result Athena must store its documents, at high cost, in a large warehouse several kilometres from its office.

Athena Ltd has finance to update its document storage facilities. The Chairman is thinking of several storage alternatives - microfilm and CD-ROM are two possibilities.

Write a **memorandum** for Athena's Chairman. In your memorandum you should:-

(a) describe the advantages and disadvantages of storing information on microfilm and on CD-ROM

(b) consider the system implications and the human resource implications for storing information on optical media.

You may assume that documents reproduced from optical storage are legally valid.

[20]

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INFORMATICS

DIPLOMA IN COMPUTER STUDIES

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BT105 • *BUSINESS STUDIES*

MARK SCHEME

Marks for parts of questions are indicated in brackets after each part of the question.

Only allocate marks as indicated in the mark scheme.

Unless technical terms and definitions are required, accept alternative wording which conveys the same meaning as model answers.

Half marks must not be used unless indicated in the mark scheme.

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SECTION A

[40 marks]

Answer ALL questions in this section.

A1. Briefly explain the following four terms: [4]

(a) Span of control

Number of subordinates which can reasonably be expected to be managed by one manager [1]

(b) Chain of command

Levels of management through which authority and accountability pass [1]

(c) Accountability

Responsibility to a superior/responsibility for completion of contract [1]

(d) Standardisation

Ensuring that tasks are carried out to similar standards [1]

A2. State **four** reasons for change in the workplace. [4]

Sociological [1]

Technological [1]

Environmental [1]

Political [1]

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A3.

(a) Give a definition of 'Organisation Structure'.

[2]

Structure of relationship/responsibility/authority [1]
through which business aims are achieved [1]

(b) Line Relationship is one type of organisation structure. Name **two** other types.

[2]

Staff [1]
Functional [1]

A4. State the purpose of each of the following :

(a) Pay Slip

[2]

Statement of earnings from employer to employee [1]

(b) Gantt Chart

Graphical representation used in project management [1]

A5. List **four** major contents of the minutes of a meeting.

[4]

Date, Time Venue
Absent and Present
Named Chairman and Secretary
Contents itemised
AOB

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A6. The 'Classical' approach is one approach to organisational design.

The 'Systems' approach is another. State **seven** benefits obtained from a Systems Approach.

[7]

integrated approach

develops corporate approach to man-management

closer superior to subordinate relationship

responsive to environmental change

better working relationships

provision of feedback

strong interfunctional relationships

clear definitions of function

A7. Organisations may have centralised or decentralised control.

State **three** disadvantages of centralised control.

[3]

May not focus on local needs/markets/customers [1]

Slower response if reference to Head Office is required [1]

Central functions/resources may not be easily accessible [1]

A8. Planning is one functional area of management. State, and briefly describe, **four** other functional areas of management.

[8]

Organising

- grouping of activities into logical sequence

Staffing

- selection, training and appraisal of staff

Directing

- organising work for subordinates

Controlling

- monitoring performance and against standards

[1 mark for function, 1 mark for description] **[max 8]**

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A9. Outline what is involved in Segmentation Analysis.

Identification of markets **[1]**

Analysis of markets on geographical **[1]**

demographic **[1]**

socio-cultural variables **[1]**

[max 4]

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SECTION B

[60 marks]

Answer any THREE questions in this section.

B1. You have been asked to give to a group of managers a short presentation entitled "The Scientific Management Movement - Taylor's contribution to management, and its relevance to today's manager".

Write a brief **report** describing the principles of scientific management proposed by Taylor, and the relevance of these principles to management today.

[20]

For format award up to a maximum of 4 marks for a Report structure - Introduction, Main headings, Conclusions/Recommendations and Summary; [max 4]

For content award marks as follows:

Definition/Description of principles: [1 mark definition, 1 mark description]:

- **Development of the job**
  - **scientific method applied**
- **Selection of workers**
  - **scientific selection, development**
- **Bringing together workers and science**
  - **application, e.g. bonus systems**
- **Division of responsibilities**
  - **allocation of responsibilities between men and management [max 8]**

For candidate's answer on relevance today:-

Generally not relevant today because: [1 mark each]

- **doesn't contribute to theories of managing people**
- **earnings directly related to productivity, but doesn't take into account machine breakdown**
- **no allowance for inter-relationships of workgroups/function**
- **developed more as a science <u>for</u> management rather than the science <u>of</u> management**
- **other relevant points**

Note : If candidate argues that Taylor is relevant today, then give credit, but <u>only</u> if arguments provided are justified [max 5]

For style, logical summary and conclusions award up to 3 marks [max 3]

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B2. You've recently joined the Human Resources Division of a local company and, as part of your job, your boss Mr Wong has asked you to review:-

(a) the legal obligations of the company in respect of the Health, Safety and Welfare of employees,

(b) the procedures for storage of information in the company's computer

(c) the security of files and documents in the Personnel Department

(d) safeguards for ensuring the security of petty cash in the accounts department

Before you start your investigations write a **memorandum** to your boss outlining what measures you would expect to find already in place for ensuring the safety and security issues described above.

For format award up to a maximum of 4 marks for a memorandum structure - To, From, Date, [different sequence is acceptable], and Signature/Initials [max 4]

For Content award marks as follows:

(a) Compliance with legislation, safe working practices, medical and first aid facilities, counselling, work breaks, holidays. [max 4]

(b) Back-up copies, passwords, access control, physical controls, off-site storage, security of access [max 4]

(c) Locked storage, Safe, controls on authorised access, personnel staff confidentiality [max 4]

(d) Safe, locked storage, accounting records kept, authorised signatories, staff confidentiality [max 4]

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B3. You have been asked to conduct a feasibility study concerning the introduction of computer systems into Brasiliad Ltd, an advertising agency with two offices in Rio de Janeiro, Brazil. The Head Office has 15 staff: a Managing Director (MD) and Personal Assistant, 5 staff who design advertising text and graphics, 4 staff in the Accounts Department, 2 staff in Personnel, and 2 in Marketing. The Sales Office is 10 kilometres from the Head Office and has 5 staff, all involved in selling advertising services. Staff in both offices work closely together at meetings, and on the telephone. There is a PC in the MD's office but it is rarely used. Apart from this, Brasiliad has no other computing equipment.

Prepare a brief **memorandum** for the MD of Brasiliad indicating:-

(a) the benefits of computerising their agency

(b) the areas in which computer systems could be implemented

(c) the issues that the agency will need to face if computerised systems are introduced

For Format award up to a maximum of 4 marks for a memorandum - To, From, Date, signature initials ;

[max 4]

For Content award marks as follows: [1 mark each]

(a) Benefits
- **cost savings**
- **improved efficiency**
- **improved effectiveness**
- **up to date MIS**
- **economies of scale (avoiding duplication)**
- **competitive advantage**
- **other valid general benefits**

[max 4]

(b) Areas for computerisation - Any three of the following with brief details

[2 marks each]

1) **Purchasing**
2) **Sales**
3) **Order Processing**
4) **Stock Control**
5) **Payroll - wages and salaries**
6) **Any other office services**

1 mark for system title, 1 mark for brief details
= 2 marks x 3 systems

[6 marks]

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(c) Any three of the following points with reasonable explanations

[2 marks each]

- **Flexibility of the systems**
- **Security**
- **Budgets (Costs)**
- **Type of reports**
- **Available manpower**
- **Interpretation**
- **Any other acceptable points**

1 mark for term, 1 mark for brief details

= 2 marks x 3 points **[6 marks]**

B4. DataCo Pte is a software house specialising in the design, programming and implementation of computer systems for its clients. At any given time it may have several clients. Analysts and Programmers are assigned to Project Teams according to their technical skills, business knowledge and their availability to work on a project. A Project Manager has one project to manage. Analysts and Programmers may however be working on several projects, each with its own Project Manager.

Write a brief **report** which:-

(a) states the type of organisational structure described above

(b) describes the advantages and disadvantages of this type of organisational structure

(c) comments on whether any other organisational structure would be more appropriate for DataCo.

For format award up to a maximum of 4 marks for a Report structure - Introduction, Main headings, Conclusions/Recommendations and Summary;

[max 4]

(a) For naming 'Matrix' structure award 2 marks
For naming 'project based' organisation structure, award 1 mark

[max 2]

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(b) For advantages: [1 mark each] :

- **more flexible approach to doing work**
- **team culture**
- **individuals have a high degree of control over their work**
- **brings together appropriate resources**
- **people with the right skills at the right place and time**
- **other valid advantage**

For disadvantages: [1 mark each]

- **competition by teams for perhaps limited resources in company**
- **potential conflict of interests between teams**
- **short term team work (disbanding at project end)**
- **cannot easily provide economies of scale**

[max 10]

(c) Candidate may suggest other traditional structures

Award up to a maximum of 2 marks for stating them and award up to a further 2 marks if candidate gives a valid reason for suggesting they are more appropriate than a matrix structure

[max 4]

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B5. Athena Insurance Ltd is a large insurance company based in Athens, Greece. It provides worldwide insurance cover for shipping, issuing hundreds of insurance policies and processing hundreds of claims each year. By law it is required to keep permanently all original documents or authorised copies, even for insurance policies which are out of date. As a result Athena must store its documents, at high cost, in a large warehouse several kilometres from its office.

Athena Ltd has finance to update its document storage facilities. The Chairman is thinking of several storage alternatives - microfilm and CD-ROM are two possibilities.

Write a **memorandum** for Athena's Chairman. In your memorandum you should:-

(a) describe the advantages and disadvantages of storing information on microfilm and on CD-ROM

(b) consider the system implications and the human resource implications for storing information on optical media.

You may assume that documents reproduced from optical storage are legally valid.

For format award up to a maximum of 4 marks for a memorandum structure - To, From, Date, [different sequence is acceptable], and Signature/Initials [max 4]

For Content award marks as follows : [1 mark each]

For advantages:

- **space savings**
- **cost savings**
- **full warehouse may not be needed**
- **potentially lower operating costs**
- **potential staff savings**
- **faster retrieval of documents**
- **can logically group documents for automatic selection by criteria (e.g by client) for CD ROM**
- **can retrieve information for MIS (CD ROM)**
- **improved security**
- **relative advantages of CD ROM over microfilm e.g state of the art, faster retrieval**
- **other valid advantages**

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For disadvantages:

- initial costs high - hardware
  - software
- training costs
- costs of system development life cycle
- relative disadvantage of CD ROM is that it is more expensive
- Microfilm not easy to update
- other valid disadvantages

For all advantages and disadvantages award as above to - [max 12]

(c) Systems implications [1 mark each] :

- importance of correxct system design
- high risk of unworkable system if not designed properly
- choice of correct filing code system
- backup and security issues
- resistance to change by staff
- possible loss of jobs
- training on totally new system
- what to do with the original documents

[max 4]

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INFORMATICS

DIPLOMA IN COMPUTER STUDIES

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10 DECEMBER 1995

BS106 • *BUSINESS SYSTEMS*

DURATION : 2 HOURS

INSTRUCTIONS

1. Write your **CANDIDATE NUMBER** and the **MODULE NUMBER AND NAME** clearly on your answer booklet(s).
2. Answer **ALL** questions in Section A and any **THREE** from Section B.
3. Start each question in Section B on a new sheet of paper.
4. The number of marks for each part of a question is indicated in square brackets in the right hand margin.

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SECTION A

[40 marks]

Answer ALL questions in this section.

A1.

(a) State the **two** common methods of calculating depreciation on fixed assets.

[2]

(b) How is contribution calculated?

[1]

(c) Which of the following would you normally expect to find on the debit side and which on the credit side, of the Trial Balance

(i) Discounts Received

(ii) Sales Returns

(iii) Purchases Returns

(iv) Drawing

(v) A Bank Overdraft

[5]

(d) Briefly describe a typical audit trial for a credit sales transaction.

[5]

(e) State any **three** methods of verifying input data in a computerised accounting system.

[3]

(f) Name any **three** Ledgers commonly used in the division of the Ledger.

[3]

(g) What costs contribute to 'Prime Costs' ?

[3]

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(h) The following information is available for ANZ Ltd :

Average debtors $ 525, Average creditors $ 465
Sales $ 5,000, purchases $ 3,360

Calculate the following ratios (in days).

(i) Debtors Payment Period

[4]

(ii) Creditors Payment Period

[4]

A2.

(a) State four items that you would expect to find in the Stock Control Account of a ledger.

[4]

(b) State **six** items that you might expect to find in a Fixed Assets Register.

[6]

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SECTION B

[60 marks]

Answer any THREE questions in this section.

B1. Sure Succeed company currently sells 3 products and has drawn up the following operating statements:-

	Product A	Product B	Product C
Sales	$130,000	$90,000	$65,000
Direct Materials	60,000	25,000	10,000
Direct Labour	40,000	15,000	15,000
Fixed Costs	20,000	20,000	20,000
Profits	10,000	30,000	20,000

The firm is currently considering whether to discontinue selling Product A.

(a) Redraft the operating statement using the marginal costing layout and state whether in your opinion product A should be discontinued.

[12]

(b) Draft another operating statement, using the marginal costing layout, to show what the total profit would be if Product A is discontinued.

[8]

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B2.

(a) Draw up an appropriate Sales Invoice No A47320 dated 30th May, 1995 for Sure Succeed Company of 21 Princess Avenue, Singapore 9890, Republic of Singapore:

Goods Sold to Happery Traders, 925 Tanjong Road, Singapore 0808, Republic of Singapore.

Order No: 9586,Dated 20th May 1995

Terms : Trade Discount 20%, 5% Cash - 30 days

Details of items sold as follows :

20 Units of computers @ $1500

30 Boxes of diskettes @ $25

6 Printers @ $110

In addition a sales tax of 15% is payable .

Note : Marks will be awarded for Correct Layout and Calculation of charges.

[14]

(b) Show the headings that you would expect to appear at top of a typical page of a Sales Journal for Sure Succeed [Invoice amounts are not required]

[6]

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B3. The following data were obtained from the books of Sure Succeed Traders at the financial year ended 31 March 1995 :

Debit Balance		Credit Balance	
Drawings	13,290	Sales	96,210
Premises	60,000	Accruals	440
Debtors	18,900	Provision for Bad Debts	378
Bank	9,650	Creditors	11,870
Office Equipment	10,900	Accumulated Depreciation	
Stock	9,205	- Motor Vehicles	15,650
Motor Vehicles	32,000	- Office Equipment	4,465
Prepayments	210	Profit	20,152
Cash	700	Mortgage	21,900
Purchases	53,100	Discount Received	8,700

Prepare a properly laid out Balance Sheet (in a vertical Format) using the relevant figures from the above data list.

[20]

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B4. The following is an abbreviated balance sheet for Azure Ltd as at 31 December 1993 and 1994 ($'000s).

	1993	1994
Fixed Assets		
Land and buildings	750	900
Plant and machinery	750	800
Fixtures and fittings	100	200
	1600	1900
Current Assets		
Stocks	500	600
Debtors	450	600
Cash	350	400
	1300	1600
Liabilities		
Trade creditors (< 1 year)	430	500
Net Current Assets	870	1100
Net Assets	2470	3000
Creditors (> 1 year)	770	1000
Capital and Reserves	1700	2000
Total long term capital	2470	3000

From the Profit and Loss Account the Cost of Sales for 1994 was $3,260,00 and the Sales Turnover for 1994 was $5,000,000. Purchases were $3,360,000.

(a) Calculate : -

(i) The Current Ratio for each year

(ii) The Quick Ratio for each year

(iii) The Stock Turnover, in days, between 1993 and 1994.

(iv) Debtor's Turnover, in days, between 1993 and 1994.

(v) Creditor's Turnover, in days, between 1993 and 1994.

(b) What do these ratios tell you about Azure's financial performance over the two years ?

[20]

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B5. Prepare a Cash Budget for the six months July to December, from the following data :

(i) The cash Balance at the end of June is expected to be $6,000.

(ii) Sales would be 400 units per month for the quarter ending September and 600 units per month for the rest of the year. Sales for the month of May and June were 500 units per month.

(iii) All units are sold for $30 each and Debtors will be given two month's credit. 20% of the sales will be in cash.

(iv) Purchases will be 500 units per month. Each unit costs $10 and creditors are allowed one month's credit. Purchases in May and June amounted to 400 units for each month.

(v) Wages paid as they occur are $ 4,400 per month.

(vi) A 10% commission is paid to all salespersons on all sales in the month following the sale.

(vii) Rent and Rates amounted to $3,600 per year and will be paid quarterly in advance.

(viii) Office Expenses amount to $3,500 per month including depreciation of $1,000 for equipment.

[20]

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BS106 • *BUSINESS SYSTEMS*

MARK SCHEME

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SECTION A

Answer ALL questions in this section.

A1.

(a) State the **two** common methods of calculating depreciation on fixed assets.

Straight Line Method [1]

Reducing balance Method [1]

(b) How is contribution calculated?

Contribution = Selling Price - Variable Cost [1]

(c) Which of the following would you normally expect to find on the debit side and which on the credit side, of the Trial Balance

(i) Discounts Received

Credit [1]

(ii) Sales Returns

Debit [1]

(iii) Purchases Returns

Credit [1]

(iv) Drawing

Debit [1]

(v) A bank Overdraft

Credit [1]

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(d) Briefly describe a typical audit trial for a credit sales transaction. [5]

Sales Invoice [1] → Sales Daybook [1] → Sales Ledger [1] → Final Accounts [1]
Nominal Ledger [1]↗

(e) State any **three** methods of verifying input data in a computerised accounting system. [3]

Any three of the following

1 mark for each correct types of checks

Validation Checks

Range Checks

Batch totals

Any acceptable method **[max 3]**

(f) Name any **three** Ledgers commonly used in the div[illegible] the Ledger. [3]

Sales Ledger **[1]**

Purchases Ledger **[1]**

General Ledger/Nominal Ledger **[1]**

(g) What costs contribute to 'Prime Costs' ? [3]

Prime Cost is the sum of Direct labour **[1]**

Direct Expenses . **[1]**

and Direct materials **[1]**

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(h) The following information is available for ANZ Ltd :

Average debtors $ 525, Average creditors $ 465
Sales $ 5,000, purchases $ 3,360

Calculate the following ratios (in days).

(i) Debtors Payment Period [4]

$$\textbf{Debtors Payment Period} = \frac{\textbf{Debtors}}{\textbf{Sales}} * 365 \text{ Days} \quad [2]$$

$$= \frac{525}{5000} \times 365 \quad [1]$$

$$= 38 \text{ days} \quad [1]$$

(ii) Creditors Payment Period [4]

$$\textbf{Creditors Payment Period} = \frac{\textbf{Creditors}}{\textbf{Purchases}} * 365 \text{ Days} \quad [2]$$

$$= \frac{465}{3,360} * 365 \quad [1]$$

$$= 51 \text{ days} \quad [1]$$

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A2.

(a) State four items that you would expect to find in the Stock Control Account of a ledger.

[4]

- **Stock purchases value/total (from suppliers)** **[1]**
- **Requisitions value/total (out to production)** **[1]**
- **Opening stock value/totals** **[1]**
- **Closing stock, or current stock** **[1]**

(b) State six items that you might expect to find in a Fixed Assets Register.

[6]

Any six items from:- **[1 mark each]**

- **Description of asset**
- **Date of purchase**
- **original cost**
- **Annual depreciation**
- **Total depreciation to date**
- **NBV**
- **Supplier**
- **location in premises**
- **Category (Plant, furniture)**
- **Maintenance/Servicing history**

[max 6]

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SECTION B

[60 marks]

Answer any THREE questions in this section.

B1. Sure Succeed company currently sells 3 products and has drawn up the following operating statements:-

	Product A	Product B	Product C
Sales	$130,000	$90,000	$65,000
Direct Materials	60,000	25,000	10,000
Direct Labour	40,000	15,000	15,000
Fixed Costs	20,000	20,000	20,000
Profits	10,000	30,000	20,000

The firm is currently considering whether to discontinue selling Product A.

(a) Redraft the operating statement using the marginal costing layout and state whether in your opinion product A should be discontinued.

[12]

	Product A	Product B	Product C	Total	MARKS
Sales	130000	90000	65000	285000	[1]
Direct materials	60000	25000	10000	95000	[1]
Direct Labour	40000	15000	15000	70000	[1]
Contribution	30000	50000	40000	120000	[4]
Fixed Cost				60000	[1]
Profit				60000	[1]

Award Marks for correct rows as shown above

Award 1 Mark for correct layout **[max 1]**

For suggesting :

- If company wants to discontinue a product then discontinued product should be A **[1]**

- because contribution is lowest **[1]**

Alternative answer :

The company should not discontinue product A **[1]**

because there is a positive contribution **[1]**

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(b) Draft another operating statement, using the marginal costing layout, to show what the total profit would be if Product A is discontinued.

[8]

	Product B	Product C	Total	Mark
Sales	**90000**	**65000**	**155000**	**[1]**
Direct materials	**25000**	**10000**	**35000**	**[1]**
Direct Labour	**15000**	**15000**	**30000**	**[1]**
Contribution	**50000**	**40000**	**90000**	**[3]**
Fixed Cost			**60000**	**[1]**
Profit			**30000**	**[1]**

Award up to 8 marks for correct rows as shown above

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B2.

(a) Draw up an appropriate Sales Invoice No A47320 dated 30th May, 1995 for Sure Succeed Company of 21 Princess Avenue, Singapore 9890, Republic of Singapore:

[14]

Goods Sold to Happery Traders, 925 Tanjong Road Singapore 0808, Republic of Singapore.

Order No: 9586,Dated 20th May 1995

Terms : Trade Discount 20%, 5% Cash - 30 days

Details of items sold as follows:

20 Units of computers @ $1500

30 Boxes of diskettes @ $25

6 Printers @ $110

In addition a sales tax of 15% is payable .

Note : Marks will be awarded for Correct Layout and Calculation of charges.

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(a) Award marks for detail, and correct calculations shown below [max 14]

Sure Succeed Company [1]
21 Princess Avenue
Singapore 9890
Republic of Singapore

Invoice No : A47320 [1]
Date : 30th May 1995 [1]

Happery Traders [1]
925 Tanjong Road,
Singapore 0808
Republic of Singapore

Your Order No : 9586 [1] Dated : 20th May 1995 [1] Terms 5% cash 30 days [1]

Qty	Description	Unit Price	Total		Vat %	Vat $
20 Units	Computers	1500	$30,000	[1]	15	
30 Boxes	Diskettes	25	750	[1]	15	
6 Units	Printers	110	660	[1]	15	
			31,410	[1]		
	Trade Discount		6282	[1]		
			25,128	[1]		3,769.2 [1]

E. & O.E

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(b) Show the headings that you would expect to appear at top of a typical page of a Sales Journal for Sure Succeed [Invoice amounts are not required]

[6]

For Sales Journal Leadings

Sure Succeed : Sales Journal for <period> **[1]**

Date [1] Invoice No [1] Customer [1] Product X Sales [1]

For headings which also show discounts, entries for different products and credits award **[1]**

[max 6]

Sales Journal - Alternative layout

Date	Invoice No	Customer	Sale Amount	VAT (Sales Tax)	Total
[1]	[1]	[1]	[1]	[1]	[1]

1 mark for each heading **[max 6 marks]**

B3. The following data were obtained from the books of Sure Succeed Traders at the financial year ended 31 March 1995 :

Debit Balance		Credit Balance	
Drawings	13,290	Sales	96,210
Premises	60,000	Accruals	440
Debtors	18,900	Provision for Bad Debts	378
Bank	9,650	Creditors	11,870
Office Equipment	10,900	Accumulated Depreciation	
Stock	9,205	- Motor Vehicles	15,650
Motor Vehicles	32,000	- Office Equipment	4,465
Prepayments	210	Profit	20,152
Cash	700	Mortgage	21,900
Purchases	53,100	Discount Received	8,700

Prepare a properly laid out Balance Sheet (in a vertical Format) using the relevant figures from the above data list.

[20]

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SURE SUCCEED
BALANCE SHEET AS AT 31 MARCH 1995

	$ COST	$ ACCUM DEPREC	$ NBV
Fixed Assets			
Premises	60000	-	60000 [1]
Office Equipment	10900	4465 [1]	6435 [1]
Motor Vehicle	32000	15650 [1]	16350 [1]
	102900 [1]	20115 [1]	82785 [1]
Current Assets			
Debtors	18900 [1]		
less provision ofr Bad Debts	378 [1]	18522 [1]	
Bank		9650 [1]	
Stock		9205 [1]	
Prepayment		210 [1]	
Cash		700 [1]	
		38287 [1]	
Current Liabilties			
Accruals	440		
Creditors	11870	12310	
Working Capital			25977 [1]
Capital Employed			108762 [1]
Financed By			
Capital		80000	
Add Profit		20152	
		100152	
Less Drawing		13290	
			86862
Long Term Liabilities			
Mortage			21900 [1]
			108762 [1]

Award marks for correct values in correct columns as shown. [max 20]

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B4. The following is an abbreviated balance sheet for Azure Ltd as at 31 December 1993 and 1994 ($'000s).

	1993	1994
Fixed Assets		
Land and buildings	750	900
Plant and machinery	750	800
Fixtures and fittings	100	200
	1600	1900
Current Assets		
Stocks	500	600
Debtors	450	600
Cash	350	400
	1300	1600
Liabilities		
Trade creditors (< 1 year)	430	500
Net Current Assets	870	1100
Net Assets	2470	3000
Creditors (> 1 year)	770	1000
Capital and Reserves	1700	2000
Total long term capital	2470	3000

From the Profit and Loss Account the Cost of Sales for 1994 was $3,260,00 and the Sales Turnover for 1994 was $5,000,000. Purchases were $3,360,000.

(a) Calculate : -

(i) The Current Ratio for each year [3]

[Note : all amounts expressed as $'000s]

For equation : Current Assets / Current Liabilities **[1]**
For 1993 : 1300/430 = 3.02 **[1]**
For 1994 : 1600/500 = 3.20 **[1]**

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(ii) The Quick Ratio for each year [3]

For equation : (Current Assets-Stocks)/Current Liabilities [1]
For 1993 : (1300-500)/430 = 1.86 [1]
For 1994 : (1600-600)/500 = 2.0 [1]

(iii) The Stock Turnover, in days, between 1993 and 1994. [3]

For equation : (Average Stock/Cost of Sales)*365 [1]
Average Stock = (1994 Stock - 1993 Stock)/2
= 550 [1]
T/O = (550/3260)*365
= 62 days [1]

Alternative formula :
= 3260/550 = 5.93 times [1]
= 365/5.93 = 61.55
= 62 days [1]

(iv) Debtor's Turnover, in days, between 1993 and 1994. [3]

For equation : (Average Debtors/Sales)*365 [1]
Avg Debtors = (1994 Debtors-1993 Debtors)/2
= 525 [1]
T/O = (525/5000)*365
= 38 days [1]

(v) Creditor's Turnover, in days, between 1993 and 1994. [3]

For equation : (Average Creditors / Purchases) * 365 [1]
Avg Creditors = (1994 Creditors - 1993 Creditors) /2
= 465 [1]
T/O = (465/3360)*365
= 51 days [1]

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(b) What do these ratios tell you about Azure's financial performance over the two years?

[5]

Current Ratio - **healthy,**
sufficient current assets to meet liabilities
marginal improvement from 1993 to 1994 [max 1]

Liquidity Ratio - **healthy**
stocks which can't be converted to liquid funds
reflect lower ratio [max 1]

Stock T/O - **measure of efficiency of stock management**
Interpretation depends on what Azure's stocks are.
62 days is too long for fresh food, but not furniture
[max 1]

Debtors T/O - **measures extent to which credit is granted to customers**
Depends on terms of credit offered. 38 days not serious for granted TOC of 30 days, although could be improved
[max 1]

Creditors T/O - **measures the extent to which credit terms obtained from suppliers. 51 days is advantageous but must be considered in context of whether suppliers might face liquidity problems**
[max 1]

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B5. Prepare a Cash Budget for the six months July to December, from the following data :

(i) The cash Balance at the end of June is expected to be $6,000

(ii) Sales would be 400 units per month for the quarter ending September and 600 units per month for the rest of the year. Sales for the month of May and June were 500 units per month.

(iii) All units are sold for $30 each and Debtors will be given two month's credit. 20% of the sales will be in cash.

(iv) Purchases will be 500 units per month . Each unit costs $10 and creditors are allowed one month's credit. Purchases in May and June amounted to 400 units for each month.

(v) Wages paid as they occur are $ 4,400 per month.

(vi) A 10% commission is paid to all salespersons on all sales in the month following the sale.

(vii) Rent and Rates amounted to $3,600 per year and will be paid quarterly in advance.

(viii) Office Expenses amount to $3,500 per month including depreciation of $1,000 for equipment.

[20]

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Month Details	July	Aug	Sept	Oct	Nov	Dec	Marks
Debtors	12000	12000	9600	9600	9600	14400	[2]
Cash Sales	2400	2400	2400	3600	3600	3600	[2]
Total	14400	14400	12000	13200	13200	18000	
Purchases	4000	5000	5000	5000	5000	5000	
Wages	4400	4400	4400	4400	4400	4400	
Sales Commission	1500	1200	1200	1200	1800	1800	[2]
Rent & Rates	900			900			[1]
Office Expenses	2500	2500	2500	2500	2500	2500	[1]
Total Cost	13300	13100	13100	14000	13700	13700	[6]
Surplus	1100	1300	-1100	-800	-500	4300	
Opening Balance	6000	7100	8400	7300	6500	6000	
Closing Balance	7100 [1]	8400 [1]	7300 [1]	6500 [1]	6000 [1]	10300	[1]

For each correct row, award maximum row marks as shown

For each incorrect row, award marks up to maximum row mark for correct values

For closing balance, award 1 mark for each correct balance, up to max [6]

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